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CHEMICAL AGE

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PROGRESS IN CHEMICALS

IN this issue CHEMICAL AGE presents a review of the UK chemical industry during 1957 and a preview of what may be expected this year. It will be noted that articles have been specially written by leading spokesmen of the industry and throughout special attention has been paid to the question of the establishment of a European free trade area.

A special independent survey of the UK chemical industry has also been carried out by CHEMICAL AGE staff. To the statisticians we would say that it is realised that a survey of this type would be of much greater value if the percentage cover had been greater than the 12 per cent return enjoyed. The questions asked of the industry are clearly set out in page 87, and it will be seen that to cover results for the whole year, estimates only have been possible. To those manufacturers who consider the graphs show greater increases than would be expected, we would point out that, in so far as we can assess, answers to the survey were undoubtedly obtained from a greater number of large companies than from medium or small manufacturers. That is a very likely explanation, suggested by the greater ease with which records and data and also suitable staff, are available in the larger company.

What do economists think of the economic outlook for the chemical industry in 1958? The views of the Economist Intelligence Unit have been obtained. The Unit states that the main trend for the general economic position for 1958 is uncertainty but it is more definite and more confident about the outlook of the chemical industry in 1958. It is considered that production will be hampered by the credit squeeze, the rate of increase will be damped down, but not total output. Capital expenditure by the chemical industry over the last few years is now beginning to pay off, and therefore greater output and productivity is foreseen.

Although current investment is restricted, hope is expressed that in the long run no serious effects will be noted in research and development. Profit margins will undoubtedly suffer somewhat this year, and the suggestion is made of possible wage demands and other increases in costs. It is emphasised that successful exploitation of new products and better methods of production, however, brings material benefits.

Chemical industry leaders indicate that while competition is increasing in overseas markets, in particular from West Germany, British chemical producers should be able to maintain their markets and to extend them. Throughout the industry attention is being paid to the discussions regarding the setting up of a free trade area in Europe. With certain provisos, the industry as a whole feels that great opportunities await it. However, efficiency will be the keynote.

Sales promotion techniques in the light of a free trade area are dealt with by Sir Miles Thomas on page 101. Readers will note his remarks that 'the more efficiently our resources are geared for greater overseas activity, the more easily will they be able to cope with potential greater foreign pressure in Britain.' Another interesting point made by Sir Miles is that it may be that a greater organised job in the publicity field awaits the ABCM, and he suggests that corporate publicity could be considered.

The effects of a free trade area are considered in nearly all the special

articles in this issue. CHEMICAL AGE'S own survey has shown that something like 39 per cent of the British chemical producers favour the proposal for free trade, but 21 per cent are against it. The remainder are either doubtful or unable to assess the likely effects. What can be said is that the chemical and allied industries are watching developments and in the main plans are taking into consideration a free trade area.

It is particularly creditable that the UK chemical industry over the past few years has been spending over 2 per cent of the value of its production on research and developments.

It can be truly said that of all sections of the industry, that which has shown outstanding development is the petrochemicals section. Britain, after the US, leads the world as a petrochemical producer. The last year has seen many petrochemical units come into commission, many in record time, and, as is indicated in the special article on this section of chemical industry, many new plants are due to be commissioned this year. A particularly bright future is foreseen for petrochemicals in 1958 and onward. Until now emphasis has been laid on cracking to produce ethylene, but it is certain that greater use will be made of the products obtained during cracking operations, and as demand arises, petrochemical producers will set up manufacturing units. Very much linked up with petrochemical development is plastics production. There have been notable developments in high polymer chemistry during the past year and it is likely that 1958 will see even more developments in the plastics industry. Two polymers which are being watched with considerable interest are polypropylene and polycarbonates.

In the field of pharmacy, research has led and is continuing to lead to many important discoveries. Professor Linnell clearly shows the many fundamental studies in progress. He indicates, for instance, that it is probable that soon there may be available an orally administered poliomyelitis vaccine. In the antibiotic field there are hopes of an economic synthesis of penicillin compounds.

The growing importance of radioisotopes in the chemical industry is discussed in this issue by Dr. Henry Seligman (p. 97). He stresses that very great amounts of fission products will be available as atomic power plants are set up. Potential uses for radioactive materials in the chemical industry are very wide and no doubt this year will see some interesting developments.

US POLYTHENE PROBLEMS

THE TOPIC uppermost in the thoughts of US polythene producers at the present time is Du Pont's recent announcement that it has a composition of matter patent (US Patent No. 2,816,883) covering linear polythene 'no matter how it is manufactured' (CHEMICAL AGE, 28 December, 1957, p. 1042). The indications are that Du Pont would, on the grounds of this patent, make every US polythene producer take a Du Pont manufacturing licence. Indeed, it appears that Du Pont has already started discussions regarding licensing. Companies likely to be affected were noted in CHEMICAL AGE, 28 December, 1957, p.1042.

Phillips Chemical, in a recent statement, question the validity of the Du Pont claim (CHEMICAL AGE, 4 January, p.23). However, a Phillips spokesman has also stated that should the patent be determined valid and infringed, 'the effect on the production cost of Phillips' polythene would be minor and its selling price would not be increased.'

Phillips have of course licensed Grace in the US to produce polythene by their process and British Hydrocarbon Chemicals in this country. Indeed, Phillips' product is already being marketed by British Resin Products.

With regard to the Du Pont composition of matter patent, it should be noted that this type of patent only exists in the US. Karl Ziegler, inventor of another process for low-pressure polythene, knows of the Du Pont patent but states that it will not affect his US licensees. Indeed, as has already been noted, Du Pont are themselves Ziegler licensees. In connection with the Ziegler process, it is understood that Ziegler has not taken out or been able to take out US patents for his process.

The Du Pont patent composition of matter claims, which are free of any process limitation, define linear polythene in terms of its chemical structure and several typical physical properties. These properties are those of linear polythene. Du Pont claim that they have spent over $6 million on research on linear polythene since the middle 1930's, and processes were developed during the 1940's for low- and high-pressure polythene. Further patent applications were filed during 1947 to 1951. In fact, Du Pont hold a British patent No. 682 420 applied for in 1938 by L. M. Ellis. According to this patent, liquid ethylene below the critical temperature of +9°C is activated to polymerisation by radicals developed from heavy metal activated, peroxide containing, redox systems. Under these conditions it is claimed that polymerisation is possible without difficulty, at a temperature of 0°C and at pressures lower than 100 atmospheres. Ellis used for polymerisation lithium alkyls and a hydrogenation catalyst (Ni or NiO_3) on kieselguhr. There is also the proposal to combine organic compounds of the metals Li, Na, K, Mg, Zn (remarkably aluminium is not mentioned) with compounds of metals of the eighth group and first sub-group of the periodic table. The patent names Ti, Cr, V, whose compounds in combination with the same alkyl compounds of the alkaline metals, magnesium or zinc, give excellent catalysts for the Ziegler process. It is only that the metals have been recommended for activation of redox systems!

An 'exceptionally stiff' polythene with less than 10 per cent amorphous content was Du Pont's first claim.

Du Pont also gave out details in July last year (*Chem. and Engng. News*, July, 1957, p. 1071) regarding a comparison of polythene produced in the company's laboratories at 7,000 atmospheres and Ziegler-type polythene. Du Pont claimed that the two polythenes had approximately the same weight-average molecular weight, were comparable in all physical properties, although the lower melt-index value for the Ziegler-type product might indicate a different molecular weight distribution.

At the present time no one can clearly say what will be the result of the Du Pont claim. Now that the patent (applied for 2 August, 1957) has been issued, litigation which has been carried on in the US for some time has ended. It is understood several appeals have been made to US patent office tribunals (*Chem. and Engng. News*, 30 December, 1957, p. 17). But with the patent 'in the open' greater legal activity can be foreseen, unless matters are settled out of court.

In the meantime commercial production of a low-pressure polythene by a specially developed Du Pont process is expected to begin in 1960 in a plant at Laplace, La., and Du Pont of Canada will soon start construction on a low-pressure process plant at Sarnia, Ontario. Du Pont claim that their process, sought since they first synthesised linear polythene in the laboratory 10 years ago, makes possible the production of resins with an unusually broad range of properties. An experimental pilot-plant is already producing the resin at Du Pont's Sabine River Works, Texas.

ANNUAL REVIEW & 1958 PREVIEW

CA Survey Shows that Rise in Sales will Slow in 1958

SALES in every section of the chemical industry continued to expand in 1957 and are expected to continue their increase in 1958 although in most cases at a slower rate. This is disclosed by a completely independent survey of sales trends in 1957 and estimates for 1958 carried out by 'Chemical Age' staff.

The results, analysed here, are not intended to indicate definite percentage increases for each section of the chemical industry; they represent average company performance expressed as a percentage, based on the number of forms returned.

The survey also disclosed that export business continued to increase in 1957. In most sections of the industry, companies invested more in replacements, extensions, new plant and research and development in 1957.

Of all the companies replying, 78.1 per cent attributed higher sales in 1957 to an extension of facilities; 12.5 per cent did not extend their facilities. Products introduced in the past five years also contributed to the increased sales of 64.5 per cent of the companies replying. Twenty-nine per cent had not added to their ranges since 1952.

On the subject of the impending European free trade area (FTA), our survey shows that 39 per cent of companies replying favour the project, 24.1 per cent believe it will not benefit their business, 7 per cent are doubtful, and the remainder either could not assess the likely effect or did not reply to this question.

Answers to this and the other questions are discussed in greater detail under the main sections of the industry.

The questionnaire was sent to all manufacturers of chemicals and allied products. More than 12 per cent completed and returned the forms. Questions fell under four headings:

1. Percentage increase or decrease of (a) total sales over 1956; (b) export sales over 1956; and (c) percentage increase or decrease in total sales estimated in 1958.
2. If 1957 sales were higher, was the increase due to (a) extension of facilities or (b) to new products introduced since 1952?
3. Percentage increase in investment in 1957 over 1956 in (a) replacements; (b) extensions; (c) new plant; (d) research and development.
4. Is a European free trade area likely to benefit your company?

It will be seen that actual sales values were not requested.

Companies were particularly asked not to indicate their names on forms when returning them, although a number did so. It was felt that if companies were asked to indicate actual values or to disclose their names on the forms, they would not co-operate in our aim of obtaining figures that would give a valuable indication of sales trends in 1957 and intelligent estimates of trade in 1958.

The companies which did indicate their names in replying were mostly large-scale organisations. Firms replying strongly represented the most progressive elements of the industry. This is obvious from the number of returned forms which indicated large scale increases, in many cases more than 50 per cent and in about six cases higher than 100 per cent. It is stressed, therefore, that the figures given here represent averages based on the number of forms returned.

DO YOU SUPPORT FTA?
Answers Analysed

● **HEAVY CHEMICALS.** Companies operating in heavy chemicals reported a 19.5 per cent increase in their average total sales during 1957; the average increase in export sales per company was 14.35 per cent, and for this year heavy chemical producers conservatively estimate that total sales per company will be 10.6 per cent higher than in 1957. All companies reported that higher sales were largely due to an extension of facilities; less than two-thirds (60 per cent) said the increase as far as they were concerned was also due to new products introduced in the past five years.

One firm in this section anticipated a 7 per cent sales increase this year, if expressed in terms of tonnage. In terms of value, however, no rise is expected, due to a spectacular fall in raw material commodity markets.

Heavy chemical producers continued to invest more in 1957, spreading the increases over replacements (up 10 per cent), extensions (up 6.4 per cent), new plant (up 18.4 per cent), research and development (up 6.8 per cent).

Manufacturers in this section were certainly not afraid of the impending European free trade area (FTA), half of those reporting saying they favoured the move. Those completely against it represented 12½ per cent of the total; the remainder were either doubtful, could not assess the probable effect, or did not answer.

One firm with interests also in 'other fine chemicals' said it was not yet clear what the effect of the FTA would be. They added: 'It is a balance which we hope to be able to tip slightly in our direction.'

● **FERTILISERS.** Less than 10 per cent of the companies represented in this field returned our questionnaire, a figure not considered wide enough to quote. Figures referred to are official statistics relating to the year 1956-57. They support the experience of those companies that did reply.

The last 12 months' period for which total and official figures for British fertiliser *consumption* are available is from 1 July, 1956, to 30 June, 1957. These figures are stated to be provisional.

In terms of plant food weight, the totals for all fertilisers, with 1955-56 figures for comparison, were as follows:

	NITROGENOUS tons of nitrogen, N.
1956–57	302,000
1955–56	291,276
	PHOSPHATIC tons of phosphoric acid, P_2O_5
1956–57	369,000
1955–56	385,814
	POTASSIC tons of potash, K_2O
1956–57	317,750
1955–56	305,472

Some tonnage data showing the breakdown into types of phosphatic fertiliser are also available; here, too, tonnages are

in terms of plant-food content, P_2O_5, and not as weight of actual fertiliser.

PHOSPHATIC

	1956–57	1955–56
Superphosphate	173,100	179,600
Basic slag	101,500	99,500
Ground mineral phosphate ...	18,300	22,300
Miscellaneous	76,600	84,400

The miscellaneous class includes organic fertilisers such as bone meal, bone flour; triple superphosphate; treated phosphate rock products; and concentrated complete fertilisers, believed mainly to be compounds made specifically by ICI.

Compound or mixed fertilisers stayed in the lead as the biggest 'tonnage' class of fertiliser used in British farming. Actual product-tonnage figures for compounds (deliveries) were:

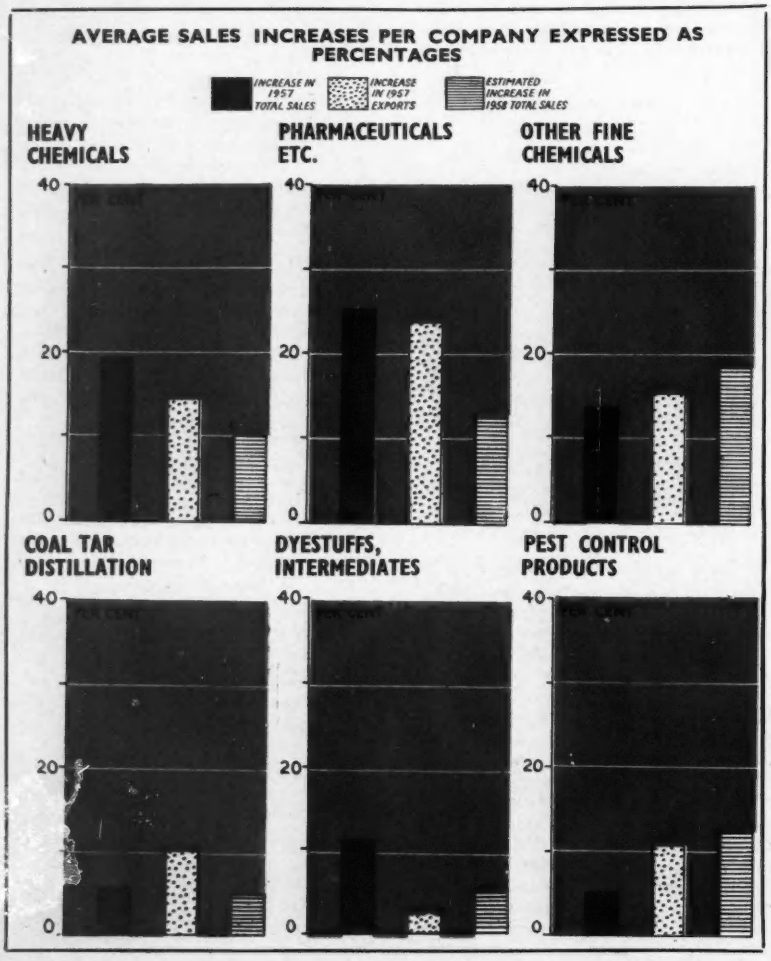
1956-57: 2,280,100 tons
1955-56: 2,061,400 tons

For comparative purposes, the 1956-57 tonnage of superphosphate was probably about 850,000, assuming an average P_2O_5-content of 18 per cent. The 1956-57 advance of 10 per cent for compound fertiliser tonnage is significant, for it occurs when nitrogen consumption has risen by only about three per cent, when that of phosphates has fallen by 2½ per cent, and with potash rising by four per cent. Clearly, farmers increasingly choose compound fertilisers because of their ease of application and the saving in labour that is made possible.

All the preceding figures are based on deliveries made by manufacturers and importers to fertiliser users within the UK. In addition there is some export trade, notably in the form of sulphate of ammonia and ammonium nitrate to Commonwealth countries and compound fertilisers to the Channel Islands. The value of this total export trade in 1956-57 was £1,260,964. This compares with a value of £3,283,887 for UK fertiliser exports in 1955-56. The drop is largely due to reduced exports of sulphate of ammonia, increased home consumption leaving smaller surpluses for sales overseas; e.g., during 1956-57, 38,708 tons of sulphate of ammonia were exported, compared with the 1955-56 tonnage of 136,366, a fall of almost 100,000 tons.

It is interesting to compare this figure with the rise in home consumption of nitrogen—10,724 tons of N in 1956-57 above 1955-56 home use. This is equivalent to about 50,000 tons of sulphate of ammonia; the rise in home use does not fully equate, therefore, with the fall in exports.

One of the companies reporting in this field and in many others said of the free trade area: 'We support the proposal and do not fear its consequences.'



● **PHARMACEUTICALS.** Manufacturers in this section showed a major increase in exports, the average increase per company reporting being 23.7 per cent over 1956. Average increase in total sales per company was 25.3 per cent; in the coming year pharmaceutical companies look for a further rise in total sales of 12.9 per cent compared with 1957.

Increases in the average sums spent by companies on investment varied, replacements being higher by 1.3 per cent; extensions up by 4.85 per cent; new plant up by 10.1 per cent; research and development by 6.75 per cent.

Half of the companies replying support the FTA, with only 15 per cent definitely against the proposal. Answers by pharmaceutical manufacturers to other questions are considered with 'other fine chemicals.'

● **OTHER FINE CHEMICALS.** A 13.8 per cent increase over 1956 total turnovers was the average experience of companies making 'fine chemicals other than pharmaceuticals.' Exports were up by an average 15.3 per cent and companies are confident of prospects in 1958, looking as they do for an average rise per company in total sales per company of 14.1 per cent over 1957.

In both the previous section and in this one, 63 per cent of the firms returning our forms said that they had extended their production facilities; 58 per cent had also introduced new products since 1952; 21 per cent did not expand production facilities; and 26.3 per cent had no new products to offer.

Average increase in spending on new plant was heavy—up by 14.3 per cent; research and development, up by 10.6 per cent; extensions by 6.3 per cent; and replacements by 3.8 per cent.

One firm which reported no change in 1957 sales and which looked for a 10 per cent increase this year, said it had been a year of consolidation. New buildings and plant had been erected and would come into use in December, 1957. Effort which would normally have been devoted to sales and production, had been spent on research, analysis and construction; all would revert to normal in readiness for 1958.

Just over half of the companies (53 per cent) favour the FTA, with 13.3 per cent definitely against it. A northern company in the pharmaceutical and fine chemical field believe the FTA will reduce the number of chemicals it can sell, but a large turnover is expected in those chemicals that the firm can make competitively.

● **COAL TAR PRODUCTS.** Average increase of 1957 total sales over 1956 of companies in the coal tar distillation field was 5.6 per cent; their exports were up by 10.2 per cent and they estimate that 1958 sales will show a further rise of 5 per cent.

Only 25 per cent of companies replying said that increased trade was due to extended facilities; the same proportion

(*Continued on page* 96)

ANNUAL REVIEW & 1958 PREVIEW

ABCM Consider Free Trade in Relation to UK Chemical Industry

THE THOUGHTS of the leaders of our various industries throughout the UK must increasingly be directed to the fact that during the year 1958 the question of the establishment or not of a European free trade area, which the UK would join, must be considered a matter of the most vital importance.

In considering the views of the chemical trade, as is well known by now, our industry has expressed to the Federation of British Industries and to the Board of Trade, our views by a large majority that the industry is in favour of the UK joining such a European free trade area. This statement was covered by qualifications to the effect that certain safeguards in relation to the chemical trade are necessary, such as anti-dumping legislation, the origin of goods and patent and trade mark laws, are among the ones of primary importance. In addition, other points, such as standard of living, wages and fringe benefits, have also to be considered with care before the ultimate treaties are drafted.

The Association of British Chemical Manufacturers consider that the negotiations concerning the establishment of a European FTA carry a first priority for their attention in the forthcoming year. They have accordingly established a council committee under the chairmanship of Mr. W. A. M. Edwards, to give constant attention to this matter.

BY
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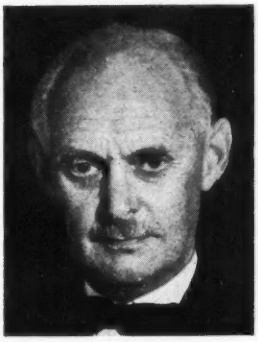
M.Sc., F.R.I.C.



Chairman of the Association of British Chemical Manufacturers

ABCM Overseas Visits

Mr. G. Brearley, director of the ABCM, and Mr. H. W. Vallender have during recent months been in contact with various bodies in Europe, and had informal exchanges of views with the officials of the chemical industries of other countries in Europe, concerning the possible European FTA.

It is important at this stage to remember the wide change of political atmosphere in relation to tariff matters which has occurred in Britain during the first half of this century. Prior to 1914, the UK had a strong free trade attitude to all international trading. One result of the 1914-1918 war was that our politicians and industrialists enquired much more closely into the impact of this former open free trade policy. New nationalisms in other countries, and in many cases increased protective measures in the form of quotas and tariffs had brought about great changes in the pattern of international trade. By the middle of the 19th century a number of chemical manufacturing firms were operating in Britain. These were mainly in family hands and concerned with the production of heavy chemicals.

The late Sir W. H. Perkin, the research genius of the country, in the middle of that century, with his production of the first synthetic aniline dye, introduced a major revolution in the textile and dye using trades. This resulted, in several countries, in the introduction of a new branch of chemical manufacture, and the earlier manufactures of inorganic chemicals were widened to include the manufacture of synthetic dyes, and by the turn of the century, to the establishment of the manufacture of many drugs and pharmaceutical products.

Although Perkin's invention and his first commercial manufacture was a British triumph, the economic advantages which resulted therefrom unfortunately did not mainly accrue to Great Britain. As is well known, they were developed soundly and well by several German firms both in regard to manufacture, and also technical services to the users of the new synthetic dyes. This new industry was well established in Germany during the 20 years prior to 1914. German firms secured a major share of the synthetic dyestuff consumption of the British textile manufacturers which, prior to 1914, exceeded 90 per cent of the total British consumption. As a result of this, although British manufacturers were fairly well equipped for industrial production of inorganic chemicals in 1914 this country was quite unprepared for the manufacture of dyestuffs, pharmaceutical products and organic explosives, whose supply from Germany was entirely cut off with the outbreak of the 1914 War. The textile industry, for example, was in a serious position for lack of dyes, for both supplying dyed fabrics to the Army and Navy, as well as for civilian purposes, and for export.

By the end of world war I a considerable success had already been made in the establishment of factories manufacturing synthetic dyes and drugs. About 1919, however, the large German firms formed the IG Farben-industrie, and this newly established organisation was loath to surrender what they envisaged as a large share of their pre-1914 market in Britain.

Fortunately, it was realised in this country that the ability to manufacture synthetic organic chemicals, dyestuffs and other similar products was of vital strategic importance to the UK in case of another war. Such industries had been started by 1919, but in the event of a price onslaught from Germany, it might be difficult for some of them to survive.

Lack of Qualified Staff

One of the important aspects of this shortage of organic chemicals and dyes was the realisation of the serious lack of qualified chemists and chemical engineers in the country, for whom there could be no livelihood, unless there was an established organic chemical industry here. If (as actually happened) these new industries in the organic side could be established, it would create a vast pool of employment for qualified technicians, and strategically in the case of another war, the country would have the necessary trained men for the synthetic production of the many things that would be wanted to keep the country going in a war economy.

This was well proved in 1939 at the outbreak of the second world war, as by that time having received 20 years' tariff

protection, we had factories, chemical plants and a large number of trained chemists to undertake the re-equipment and rearmament of the country, when faced again with war.

As a result of this, and also as a result of political thinking in regard to other industries, a large political change had developed in the policy of the country as a whole between 1920 and 1932. The first major move was the passing of the Dyestuff (Import Regulation) Act in 1920, which was followed in 1921 by the Safeguarding of Industries Act.

The chemical industry as a result was able to expand very rapidly during the second world war, largely of course, manufacturing chemicals for the various services, and there can be no doubt that when the last war terminated, the organic section of the British chemical industry was well and soundly established.

After a further 12 years, the industry, having received 30 years' tariff protection, has expanded again very rapidly since 1945, and we believe is capable of standing up to competition from any country in the world, in quality, price and delivery. Our industry does, I am glad to report, take its place among the largest chemical industries in the world.

Since the last war there has been a very considerable expansion in the industry, and the investment in capital equipment of new factories and plant, research laboratories and other things has exceeded £500 million sterling. This vast sum of newly invested money has gone, not only into the traditional industries of heavy chemicals and the synthetic aromatic organic chemicals, but has also been utilised for the development and expansion of completely new branches of the industry.

Better Processes

In relation to the production of heavy chemicals, there is no doubt that considerable improvements in processes have been made, and modern plants of extremely high efficiency have been established, and this section of our work shows a real solid foundation. The traditional branches of the industry covering dyes and synthetic aromatic organic chemicals have also expanded very considerably since 1945.

A major new development, however, of the industry has occurred in the petrochemical section, and many quite new products have been discovered and are actually in production on a large scale. By 1958 £90 million sterling of capital will have been expended in the development of this section alone, in our industry. Although some work had been done prior to the war, the main development has occurred since 1945.

Among the chemicals that are now available from the British petrochemical industry are the anionic type of detergent powder based on propylene, ethylene glycol, which is made for the manufacture of Terylene, and products such as butadiene and styrene, which are made for the production of synthetic rubber.

The growing plastics and synthetic fibres industries, as well as many solvents such as acetone, ethyl alcohol, ethyl methyl ketone and the butanols, are now largely based on petroleum.

The petrochemical industry now produces annually over 250,000 tons of chemicals, including for example 60,000 tons of synthetic ethyl alcohol which represents half the total industrial ethanol production of the country. Other important production figures include acetone 75,000 tons, polythene 60,000 tons and when the new polystyrene plants come into commission their output will be over 30,000 tons, per annum.

Although the manufacture of sulphuric acid from anhydrite was known prior to the war, its development industrially did not occur until more recent years. Today, however, this valuable indigenous raw material has enabled the country to replace a considerable part of its imported sulphur by this home-produced material for the manufacture of the vital sulphuric acid needed throughout the industries in the country.

The pharmaceutical section of the industry has also expanded its range of products with the introduction of new chemicals and antibiotic drugs, penicillin, streptomycin, chlorotetracycline and other products.

The production of silicones and their derivatives has also played its part among the valuable new products now available for use in other trades,

Eye on Productivity

The industry has devoted particular attention in recent years to improving its productivity, and to work study. The ABCM has established six area committees especially dealing with productivity and matters such as work study. Instrumentation and many other new techniques are studied and discussed at the meetings of these productivity committees. It is pleasing to report that these committees do not only include the manufacturers of the country. They include also representatives of the Association of Chemical and Allied Employers and representatives nominated by the trade unions concerned with the chemical industry. The result of all this detailed study in the different areas, and in the different factories throughout the country has been a marked improvement in efficiency. In fact, the index of production has been doubled since 1948.

The ABCM has, in addition to the above work concerning productivity, established technical services available for their members to assist them in matters involving effluents, the Clean Air Act, chemical engineering, traffic, and trade marks and patents. In addition, it is constantly examining any matters which might involve Parliamentary legislation, so as to ensure that the interests of the trade are carefully watched at all times.

Research and development have received increased attention from the leaders of the chemical industry both for the improvement of existing processes and for the establishment of new products. In addition to this, our research teams have made a wide study concerning the best method of utilisation of products, so as to assist other industries who may be needing such new chemicals, to use them in the best and most valuable way. Large sums have been spent in this research and development programme, throughout the country, for example in 1956, over £17½ million.

The industry as a whole has, from being an importing section of our trade, prior to 1914, now become an important direct exporter of its products, as well as an indirect exporter through many of our other industries—textile, steel and others—who are dependent on home-produced chemicals for the manufacture of their own products. A detailed article by Mr. George Brearley, Director of the Association of British Chemical Manufacturers, is published elsewhere in this Journal, but I can add a small summary. Today the British chemical industry is exporting at the rate of £270 million sterling per annum, and is fourth in the list of exporting industries in the UK. It accounts for more than 9 per cent by value of the total of all British exported manufacturing goods.

Some 50 per cent of these direct exports go to the sterling area, the principal markets being Australia, India and South Africa, 9 per cent to the dollar area, and 27 per cent to the OEEC countries. It is not possible in a short article to analyse these exports in detail, but the 1956 figures show among the important branches of the trade the following direct exports:

	(£ million)
Drugs, Medicines and Medicinal Preparations	35.9
Paints and Pigments	23.5
Plastics Materials	26.1

Increasing Inflation

The difficulties which are occurring in the whole of the British economy with increasing inflation are a source of concern to all of us. We must, however, also realise that this inflation is not only occurring in the UK, but also in the US, and other countries as well. Repeated inflations and the balance of payment crises have occurred in France, but these, while serious, have on the other hand tended to obscure in our minds in Britain the remarkable economic progress which has been made by France since the end of the war. The past 10 years have seen a rising standard of living, and industrial and agricultural development equal to the achievements of almost any other member country in the OEEC. Germany's extreme creditor position today is basically derived from the large continuing trade surplus, but this is unlikely to be brought under control adequately without further action by Germany. We must remember also that Germany, like the UK and France, is faced with inflation and the possibility of demands for increased wage standards in many branches in its industry.

The ABCM includes practically the whole of the firms concerned with manufacture of chemicals and allied products. The total membership today is 234, of which, of course, Imperial Chemical Industries Ltd. is by far the largest. When

(*Continued on page* 96)

PETROCHEMICALS— 1957 and After

By
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of the
Chemicals Department
Esso Petroleum Co. Ltd.

IN 1957 the petrochemical industry has achieved a record increase of 32 per cent in output of chemicals over the 1956 production of 326,000 tons. This resulted from an increase of 500,000 tons (or 52 per cent) in the quality of petroleum feedstock (oil, refinery gas and wax) processed by chemical units in 1957 compared with the previous year.

This significant achievement was made possible by the numerous new petroleum chemical units or extensions to existing equipment which were completed at the end of 1956 or during 1957 and a review of the new plant commissioned during the year is presented later.

For the purpose of this article the definition of a petroleum chemical includes all those referred to in the well-known OEEC report (1), together with sulphur and carbon black from petroleum feedstocks and, for the future, ammonia from oil gasification. Statistics presented here show some differences from those in the aforementioned report which excludes carbon black and sulphur.

Graph 1 (2) illustrates the growing importance of petroleum as a raw material for the production of organic chemicals in the UK. It can be seen that the remarkable rate of increase during the period 1953-7 is expected to be maintained in the future. Comparison is made with the position in the US where the petrochemical industry has developed more rapidly because of greater overall requirements, the ample availability of petroleum feedstocks and a shortage of alternative sources of organic chemicals.

The production of chemicals from petroleum together with the throughput of feedstock for the years 1953 to 1957 with estimates for 1960 are shown in Table 1. These estimates are based on announced expansion plans by the industry with the assumption that new units will run substantially at designed capacity within a year of start-up. The data show that a continued increase in output is expected over the period 1957 to 1960. Output of chemicals has been expressed in the form of carbon content as adopted by the OEEC with the addition of sulphur and ammonia at actual production value.

Comparing the position in the US, Table 2 (3) gives gross output of finished chemicals derived from petroleum over the same period. It is difficult to make a strict comparison of these two sets of data due to the different basis of output but if the carbon content equivalent of the American production of chemicals is taken very approximately as 50 per cent it is seen that this would give an output for 1957 of 9 million tons carbon content —over 20 times the UK production.

A large proportion of chemicals produced from petroleum is derived from ethylene and propylene which are in turn obtained by thermally cracking suitable liquid petroleum fractions. The more important of these derivatives are ethanol, ethylene oxide, ethylene glycol, ethyl chloride, styrene, polythene, isopropyl alcohol, acetone and tetrapropyl benzene. Both these olefins are produced in catalytic cracking operations for motor spirit production but in the case of ethylene, the quantity available is relatively small and specially designed thermal crackers to maximise ethylene yield are therefore used to provide the ethylene feed for chemicals conversion. The rapid expansion in output from these 'chemical' crackers is illustrated in Table 3.

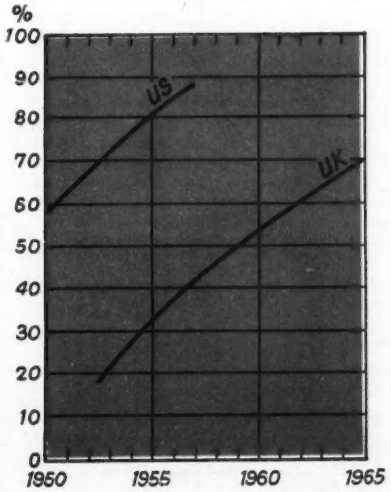
An estimated 20,000 tons of ethylene and 50,000 tons propylene are also being separated from catalytic cracking operations for use in the manufacture of tetraethyl lead, isopropyl alcohol and tetrapropyl benzene. The total quantity of propylene present in catalytic cracker gases is estimated at more than 200,000 tons/year so that if this can be spared from fuel or motor spirit outlets there is available a large potential source of a raw material, much of which can be diverted to chemicals.

Capacity for production of other petroleum derived olefins and chemical raw materials is also growing rapidly as will be seen from the review of new plants which follows.

New Plant Operating in 1957. Imperial

GRAPH 1

Per Cent of Organic Chemicals Made from Petroleum



Chemical Industries' second petroleum cracking plant at Wilton came into operation at the end of 1956, and has now had its first full year of production. This second plant, which is similar in size to the first unit, has a liquid feed throughput of 200,000 tons propylene and lesser quantities of butylenes and butadiene. ICI's 1957 capacity for olefins production was therefore doubled and further conversion units were brought into operation, such as for example, polythene plant, capacity for which rose from 45,000 tons in 1956 to 57,000 tons in 1957. The additional ethylene was much needed since ICI had earlier used the less attractive route of producing ethylene by catalytic dehydrogenation of alcohol in order to provide sufficient feed for the polythene plant.

At the same time, ICI started up their butadiene extraction plant at Wilton to separate butadiene from the C_4 stream of Nos. 1 and 2 cracking plants. Capacity has been estimated at 7,000 tons a year, and although ICI will probably require the bulk of this at a later date when full production of their 'Butakon' polymers is achieved, at present they are exporting some in rail tank cars to Italy.

The plant to manufacture these 'Butakon' polymers is now being commissioned at Wilton and total capacity of the plant is 10,000 tons a year. Three types of butadiene co-polymer will be produced, namely a butadiene/styrene resin which will find outlets mainly as a rubber reinforcement resin for shoe soling, a butadiene/acrylonitrile synthetic rubber (nitrile or N-type rubber) which, because of its high oil resistance, will be used extensively for oil seals, gaskets and hoses, and finally, a butadiene/methylmethacrylate co-polymer for emulsion paints.

In May, ICI Billingham Division started up their second carbonylation plant for the manufacture of alcohols from olefins by the oxo process. This new plant will be used for the production of butanols which until now have been made on the No. 1 unit and is believed

TABLE 2
Gross Output of Petrochemicals in the US

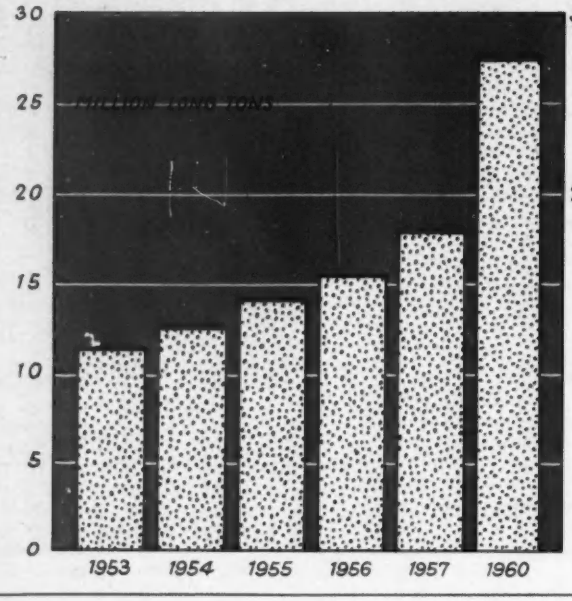
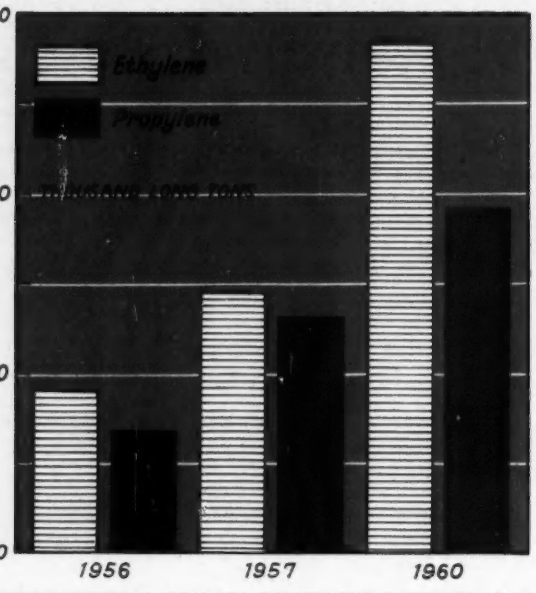


TABLE 3
UK Ethylene and Propylene Output from Petrochemicals Plant



to have a capacity approaching 20,000 tons per year. The No. 1 plant with estimated capacity of around 20,000 tons a year will now concentrate on higher 'plasticiser' alcohols such as iso-octanol and mixed C_7-C_9 alcohols, the market for which is expanding rapidly as polyvinyl chloride capacity rises. ICI now appear to have the largest oxo alcohol capacity in the world.

In connection with oxo alcohol manufacture, Esso Petroleum Co. started production in January 1957 at Fawley of higher olefins suitable for conversion to 'plasticiser' alcohols and this represents the first chemical raw material to come from Esso's new petrochemical operations.

At the large petroleum chemical centre at Grangemouth, British Hydrocarbon Chemicals put into operation their second petroleum cracking plant during the early part of last year. This new cracker is similar in size to their No. 1 unit with a liquid naphtha feed of about 240,000 tons a year and ethylene output at more than 30,000 tons a year together with a similar quantity of propylene and lower amounts of butylenes and butadiene. Associated with this, BHC have commissioned a second plant to produce ethanol by catalytic hydration of ethylene, thus doubling their ethanol capacity to a current total of 60,000 tons a year.

BHC are also now separating butadiene from the C_4 stream from their two crackers, and in this case it is not used in their own operations and is being supplied to such companies as Dunlop, British Geon and Monsanto for production of synthetic rubber. Butadiene capacity is estimated at around 10,000 tons. Last spring BHC completed a plant of capacity 20,000 tons a year for the production of propylene tetramer using propylene feed from their cracking operations. Half of this output goes to their adjacent subsidiary company, Grange Chemicals, for the production of tetrapropyl benzene (detergent alkylate) and of the remainder the bulk is believed to be exported.

A further subsidiary of BHC at Grangemouth, Forth Chemicals Ltd., commissioned new extensions to their styrene plant at the end of 1956 and production during 1957 was greatly increased. The original plant capacity of 20,000 tons a year of styrene monomer was raised to over 30,000 tons and as a result of this increased output, imports of styrene monomer into the UK have dropped from 10,400 tons for the period January to September, 1956, to 3,200 tons for the same period last year. The ethylene feed to produce the ethyl benzene for subsequent dehydrogenation to styrene is supplied by BHC.

Shell Chemicals' new alkylate plant with a capacity of 30,000 tons a year of tetrapropyl benzene commenced operation at the end of 1956 at an output rate of 24,000 tons a year and the output has been stepped up this year to 28,000 tons of which 13,000 tons is destined for export. Production from this new plant has now enabled imports from Shell's Curacao plant to be stopped.

Shell Chemicals also started up their semi-commercial scale Ziegler type polythene plant in June this year. This plant has a capacity of 1,000 tons of polythene a year and Shell are actively developing the market for this type of polythene which represents the first low-pressure type manufactured in the UK. Shell's future expansion of polythene capacity undoubtedly depends on the results of the current market development activities.

Another company which has started a small commercial unit this year was the Dunlop Rubber Co., with a 1,500 tons a year GR-S synthetic rubber (butadiene/styrene co-polymer) plant. This plant is primarily intended to provide experience in manufacturing and handling GR-S rubber prior to the start-up next year of the new 50,000 tons a year plant to be operated at Fawley by the International Synthetic Rubber Co., in which Dunlop are the major shareholders.

Two other synthetic rubber plants commenced operation last year. The first is the British Geon plant at Barry, producing butadiene/acrylonitrile synthetic rubber (Nitrile rubber) with an estimated capacity of about 5,000 tons a year and the second, Monsanto Chemicals' 4,000 tons a year capacity butadiene/styrene resin plant at Newport. This latter product, to be sold under the brand name Tred, will be used for rubber reinforcement for shoe soles.

Chemical Plant under Construction or Planned. Table 4 gives a list of petrochemical plants now under construction or in the planning stage. Of necessity petrochemical operations are concentrated at certain strategic centres to reduce difficulties in transportation of raw materials. Thus at Grangemouth further expansion is planned on units which will utilise ethylene from British Hydrocarbon Chemicals' cracking plant. Similarly ICI at Wilton are expanding ethylene

TABLE 1
Output of Petroleum Chemicals * and Consumption of Petroleum Feedstock in UK Chemical Operations

	Carbon Content† of Chemicals Manufactured	*Consumption of Feedstock (Oil, Refinery Gas & Wax)*
1953	185,000	670,000
1954	258,000	820,000
1955	310,000	920,000
1956	326,000	950,000
1957 (Est.)	429,000	1,450,000
1960 (Est.)	877,000	2,300,000

*All derived chemicals based on petroleum including carbon black, sulphur and ammonia.

†Sulphur and ammonia included at actual quantities produced.

production and the plant to convert this ethylene to chemical products. Shell Chemicals at Partington are expanding the original Petrochemicals plant and also have other plans at Stanlow and Shell Haven.

Of particular interest is the new development at the country's largest oil refinery at Fawley where Esso Petroleum are constructing a cracking unit to produce chemical raw materials. Three companies, the International Synthetic Rubber Company, Monsanto and Union Carbide are erecting chemical plants at Fawley, drawing chemical feed from Esso, and this area is rapidly becoming a major new petroleum chemicals centre.

Future Trends. The emphasis of the petrochemical industry to date has been mainly on the thermal cracker as a means of producing ethylene for chemicals conversion. However, the ethylene yield is only around 15 per cent based on liquid feed and almost as much propylene and lesser quantities of C_4 and higher olefins are produced in this type of operation. As the scale of cracking operations grows there will be a greater desire to make fullest use of all products from oil cracking and particularly of propylene which, as discussed earlier, could be available in very large quantities. Much interest has been shown in polypropylene (4), the plastic initially developed by Professor Natta, and it is possible that production of this material may be undertaken in the UK within the next few years. More attention will also be given to other propylene derivatives.

With the increasing requirements for ethylene and the efforts to improve the economics of production there is every possibility that ethylene may be used as a starting material for polyvinyl chloride manufacture in place of acetylene. This trend has already been forecast in Germany. With ethylene oxide available in larger quantities, acetylene may be displaced from a further outlet—acrylonitrile, which will be required in increasing amounts in the manufacture of synthetic fibres of the Acrilan type. The ethylene oxide route to acrylonitrile is already being used successfully in the US (5).

Increased interest in the utilisation of higher olefins may well lead to the manufacture of iso-sebacic acid from butadiene. This acid is already being produced in commercial quantities in this manner in the US (6) and can replace the more costly sebacic acid in plasticisers and synthetic lubricants. The growing catalytic reforming capacity at oil refineries to produce higher octane motor spirit will also make available an attractive source of aromatics, particularly the

(*Continued on page* 98)

TABLE 4

Petrochemical Plants Under Construction or Planned

COMPANY	LOCATION	PLANT	YEARLY CAPACITY	ON STREAM
British Hydrocarbon Chemicals	Grangemouth	Polythene	11,000 tons	1959
British Hydrocarbon Chemicals	Grangemouth	Phenol (or cumene)	—	1959
Union Carbide	Grangemouth	Polythene	11,500 tons	1958
Imperial Chemical Industries	Wilton	No. 3 petroleum cracking plant	45,000 tons * ethylene plus propylene and C_4 olefins	1959
Imperial Chemical Industries	Wilton	Polythene	Addition of 35,000 tons	1959
Imperial Chemical Industries	Wilton	Ethylene glycol	Increased to total of 16,000 tons	1959
Imperial Chemical Industries	Wilton	Terylene	Addition of 3,500 tons Addition of 9,000 tons	1958 Later
Imperial Chemical Industries	Billingham	Carbonylation plant for oxo alcohols	Addition of 20,000 tons	1959
Imperial Chemical Industries	Billingham	Oil gasification for ammonia production	60,000 tons ammonia	1958
Imperial Chemical Industries	Darwen, Lancs.	Melinex film (polythene terephthalate)	—	—
Imperial Chemical Industries	Severn	£100 million petrochemical plant	—	1970
Shell Chemicals	Partington and Stanlow	Ethylene	Addition of 45,000 tons *	1958/9
Shell Chemicals	Partington	Ethylene oxide (original 12,000 ton plant will go over to propylene oxide)	New 25,000-ton plant	1958
Shell Chemicals	Partington	Styrene	Addition of 15,000 tons *	1958
Shell Chemicals	Shell Haven	Oil gasification for ammonia production	75,000 tons ammonia	1958
Esso Petroleum Co.	Fawley	Petroleum cracking and olefins separation plant	40,000 tons butadiene plus ethylene and propylene	1958
International Synthetic Rubber	Fawley	GR-S synthetic rubber	50,000 tons	1958
Monsanto Chemicals	Fawley	Polythene	10,000 tons	1959
Union Carbide	Fawley	Ethylene oxide, glycol and derivatives	20,000 tons	1959

*Estimated.

Prospects for Fertilisers

British Farmers Lag in Progress in Grassland Fertilisation

ANNUAL UK consumption of the three major fertiliser nutrients for the past three years has been:

	(tons of plant-food)		
	N	P_2O_5	K_2O
1954-55	248,100	334,600	252,400
1955-56	291,300	385,800	305,400
1956-57	302,000	369,600	317,700

The advances for 1955-57 are small, rather smaller than year-by-year advances previously recorded.

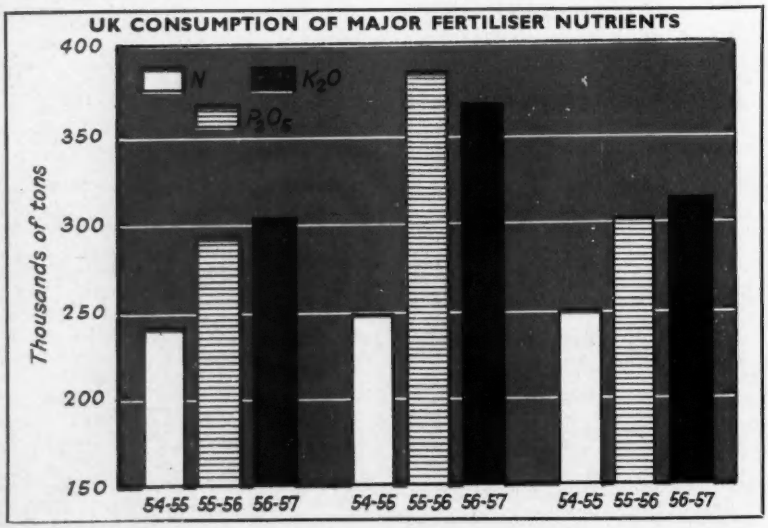
In NPK total, a rise of only 1.6 per cent has been shown over 1955-56 consumption, whereas the previous year's rise was one of 17 per cent. Nevertheless, comments made in a similar review last year (CHEMICAL AGE, 1957, **77**, 209-10) still hold good; most farmers, despite steadily falling margins between costs and sale-prices for their own products, are recognising that cutting down fertiliser dressings will prove false economy for, by lowering yield per acre, it will, in fact, raise costs of production per crop unit.

By
D. P. HOPKINS
B.Sc., F.R.I.C.

Clearly, however, grassland fertiliser use is not making much expansion; at any rate, if it is assumed that fertiliser rates on arable land are being maintained, an assumption few agriculturists would query. This slow progress with grassland fertilisation is hard to understand, for here we are far behind the best European standards, e.g., Holland, Denmark, Germany. Figures for 1955-56 suggested good progress, but the new figures hardly renew this optimism. The Minister of Agriculture's decision this autumn to form a Grassland Utilisation Committee, under the chairmanship of an economist, is not irrelevant. It is easier to grow more grass through fertiliser use than to utilise it non-wastefully; good utilisation often requires changes in farm policy. Present national expenditure on imported feeding stuffs proves beyond doubt that more feed for cattle and stock should come from our huge grassland acreage; and there is no arable crop that responds as profitably to fertilisers as grass.

Yield Per 1s Spent

A report from the West of Scotland Agriculture College gave results for intensively managed pastures on 10 farms in 1954-56; the demonstration areas, compared with other pastures on the same farms, showed that each shilling spent on fertilisers produced an average increase in output (as starch equivalent) worth 2s 2d. On six of the treated pastures the rate of extra profit was of the order of £8 or more per acre. This is typical of much evidence from tests and advisory centres—*but* the practice of giving generous fertiliser applications to grass is expanding only slowly.

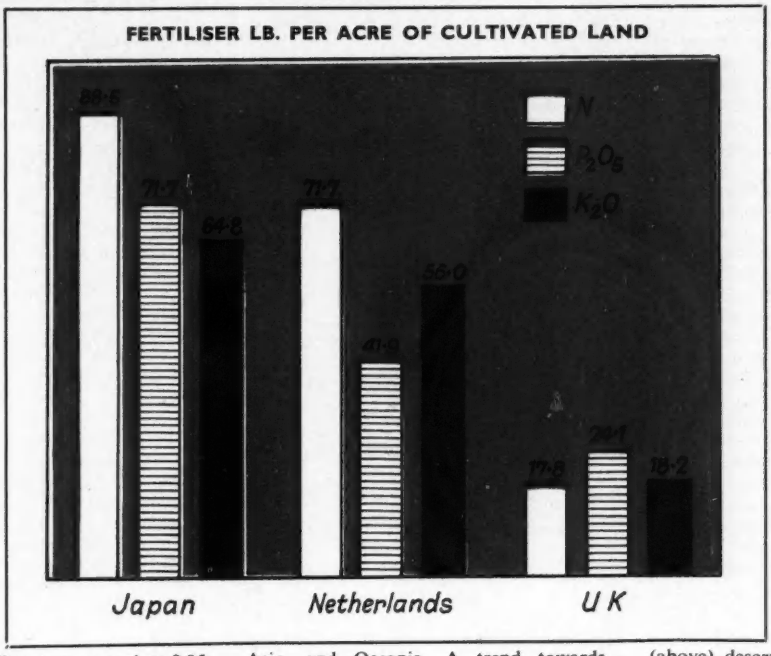


An outstanding agricultural publication of 1957 has been the joint NAAS-Rothamsted survey of post-war nitrogen use on cereal crops (E. R. Bullen and W. J. Lessells, *J. Agric. Science*, 1957, **49**, 319-328). All experimental results between 1945 and 1955 were analysed, closely following the lines of the Crowther-Yates survey for 1900-1940. Except for oats, the average response to a standard dressing (0.25 cwt. per acre N) has risen above the 1900-40 average; this seems due entirely to the introduction of new varieties whose stronger-straw character enables them to respond to nitrogen more fully. This is apparent when 1945-55 results are sub-analysed for varieties; the average response for these new varieties is much higher, and that for other varieties is slightly lower, than the older 1900-40 figures. New optimum (most highly profitable) rates for nitrogen have been estimated from the survey data. Net returns of from £10 to £5 per acre can be secured, according to variety, for dressings of 3½ to 2½ cwt. of sulphate of ammonia (or equivalent) per acre. These recommendations are based upon the results of several hundred experiments; moreover, the survey showed no evidence that responses of cereals to nitrogen had regional variations, other than in very high rainfall areas. This must be set beside other evidence from a farm practice survey for 1950-54, reported in late 1956 (B. M. Church, *J. Sci. Food and Agri.*, 1956, **7**, 711-720.) This showed that more than a third of the cereal acreage received no nitrogen at all, and that the average rate, on farms where nitrogen was given, was under a half of the amount now recommended by Bullen and Lessells. There is, therefore, enormous room for increasing the nitrogen fertiliser given to cereals, mainly to modern varieties of wheat and barley. Here again the very small rise in 1956-57 nitrogen usage suggests that farming's technical progress is slowing down. For 1957-58 there has been an increase in the farm subsidy for nitrogen, e.g., per ton of sulphate of ammonia used, it is now £8 18s 6d where it was previously £6 15s. The price of sulphate of ammonia has risen by only 6s per ton. Greater inducement to use adequate nitrogen dressings could hardly be offered.

World demand for nitrogen is showing more definitely expansive trends, often in areas where former use of fertilisers has been meagre. FAO data—admittedly in

estimate form for 1956-57—showed the following (approximate) percentage advances over 1955-56 (see first table below).

A review by the Netherlands Economic Institute has estimated world demand in 1960 to become 2,000,000 metric tons larger than in 1953-54. Assuming continued increases in production at the present annual rate, the supply by then will be about 200,000 tons above this total estimated world demand, i.e., 8,300,000 tons production for 8,100,000 tons requirement. Of this prospective 1960 demand, Europe is expected to require 38 to 39 per cent—3.1 million tons as against 2.95 million tons now.



	Per Cent
Europe	5.0
N & Central America	5.0
South America	4.0
Asia	9.0
Africa	1.5
Oceania	5.0

In view of Customs Union proposals, it may be of interest to examine the position of European countries for nitrogen. Ten are self-sufficient and also producing surpluses for export—Austria, Belgium, France, Western Germany, Iceland, Italy, Netherlands, Norway, Switzerland, and the UK. The biggest surpluses are Western Germany's 293,000 tons, Norway's 156,000, Belgium's 148,000, the Netherlands' 106,000. The UK surplus is 56,000 tons. Europe's surplus nitrogen production has almost doubled since 1954.

For similar reasons, European countries' exportable surpluses of phosphoric acid fertilisers are worth noting. Six countries have sizeable surpluses—in tons of P_2O_5, as follows:

	Tons of P_2O_5
Belgium	191,000
Luxembourg	97,000
Netherlands	47,000
France	39,000
Italy	21,000
West Germany	13,000

But neither world nor European demand for phosphatic fertilisers is or has recently been expanding at a rate comparable with nitrogen's expansion. For Europe, nitrogen demand from 1954 to 1957 rose by 23 per cent, phosphate demand by only eight per cent; for the world in the same three-year period the two percentage rises are N, 21 per cent, and P_2O_5, 10 per cent. The only marked increases for phosphate use are in areas distant from Europe—South America, Asia, and Oceania. A trend towards heavy surplus production in Europe and consequent competition that favours buyers is therefore possible—though this could be offset by unfavourable political difficulties in North Africa where so much of Europe's raw mineral phosphate originates.

The phosphate demand position is undoubtedly being affected by a strong tendency among agricultural advisers to recommend maintenance rather than increases in present standards of phosphate application. The validity of this view has been queried in at least two papers of 1957, both of which urge longer-term assessment for the economic benefits of phosphate. (*Fertiliser and Feeding Stuffs J.*, 1957, **44,** 341; and *Agricultural Chemicals*, 1957, **12,** 10, 42.)

Potash can be briefly discussed; its demand curve closely follows that of nitrogen, its production is the concern of fewer producing countries. The outstanding development is the US-stimulated drive to deep-mine Canadian deposits (see *Fertiliser and Feeding Stuffs J.*, 1957, **47,** 147), a long-term project apparently designed to relieve the US from excessive dependence upon her own potash deposits in New Mexico!

It seems a fair enough summary of the world position to say that consumption is now rising slowly in most countries where fertiliser use is well established in farm practice; but although use is indeed rising in countries where fertilisers have been much under-used in the past, the rate of expansion is on the whole disappointingly slow. The problem seems both economic and educational. The fact remains—and it is a major world fact—that world crop yields are *not* rising at the same rate as world population. Yields rose by eight per cent from 1947-54; population by 11 per cent. Ninety thousand more people are added to world figures every day. Nuclear energy and outer space excursions seem unlikely to relieve this fundamental trend towards food shortage per capita. Admittedly, large food stocks from past harvests exist in North America, but this is a fortuitous legacy that the world's rising numbers could speedily absorb. The food-supply vulnerability of a country like Britain, importing 40-45 per cent of its needs, is little realised, even by agriculturists. The extent to which Japan, with more people and less land, uses fertilisers to ease her situation has been usefully emphasised by a 1957-published paper (H. L. Richardson, *Fertiliser Society Proceedings*, No. **41,** p. 48). Dutch use of fertilisers is often assumed to be the highest in the world, but the figures for 1954-55 (above) deserve consideration:

However, since 1954-55, according to the last FAO Review, Japan's consumption of N has risen by 17 per cent, of phosphate by 29 per cent, of potash by 14 per cent, compared for the Netherlands with a 1½ per cent fall in N, a one per cent rise for phosphate, and a 17 per cent rise for potash. This makes Japan's current nitrogen use per acre 103 lb. to the Dutch 70-71 lb., her P_2O_5 about 54 lb. per acre to the Dutch 42-43 lb.

As for production and manufacturing technology, less attention now seems to be paid to new nitric acid methods of treating mineral phosphate, possibly because the general sulphur and sulphuric acid situation has eased. US granulation advances continue and detailed papers on methods and technique have appeared (J. O. Hardesty and H. F. Rapp, *J. Agric. and Food Chem.*, 1957, **5,** 426; E. J. Leister, *Agricultural Chemicals*, 1957, **12,** 2, 31; J. J. Neilsson, *ibid.*, **12,** 2, 32; E. C. Perrine, *ibid.*, 1956, **11,** 11, 36). Though US interest in granulation has lagged several years behind our own, open discussions of methods and problems have been far more marked there; however, late in 1957, this trend was abruptly changed by A. T. Brook's most comprehensive paper on granulation, read to the Fertiliser Society. A summary of this notable paper has already been given (see CHEMICAL AGE, 1957, **78,** 877).

It is difficult to compare UK and US progress. The American use of ammonia or nitrogen solutions creates different problems of formulation. Some common points now seem firmly established, however. Compounds high in N require intensive drying to be free from caking hazards; final moisture contents of two per cent down to one per cent are needed.

(*Continued on next page*)

CHEMICAL SALES ANALYSED

(*Continued from page* 88).

added that 'new products' also contributed to the increase. One company in this field attributed its higher sales figures to a combination of increased prices over the Suez period and to a reduction of stocks.

Average increases in investment were: replacements up by 6.25 per cent, extensions 3.3 per cent, new plant 15 per cent. Most companies showed little change in spending on research and development, but one company spent 15 per cent less under this heading than in 1956.

A company which held its investments at the 1956 level pointed out that there could be no increased productivity in the industry based on increasing the supply of its raw material, because the manufacturers did not control the production of coal tar. Improved efficiency therefore depended largely on improved marketing of the products and lower costs of production. Capital investment in the form of replacements or extensions had to be carefully considered in the light of those overriding circumstances.

Fifty per cent were against the FTA, one company saying the scheme would not benefit them directly but that in the long term it might offer other benefits.

● **DYESTUFFS.** In the dyestuffs and intermediates group, companies reporting experienced an average increase in 1957 sales of 11.2 per cent, with exports up by an average of 2.5 per cent. For 1958, these companies estimate that total sales will rise by 5.6 per cent.

In each case, companies state that increased 1957 sales were due to extended facilities, while 80 per cent attribute higher turnover also to products introduced in the previous five years.

Particulars of investments in this sector of the industry varied considerably from company to company. The average increases were: replacements 5.6 per cent, extensions, figures not available, new plant 6.7 per cent, research and development 7 per cent.

Of the companies replying, 30 per cent favoured FTA, none were against, the remainder being either doubtful of the consequences or not yet able to assess them. One felt that only the light of further international discussion and actual experience could enable them to say whether the FTA would benefit them.

● **PEST CONTROL PRODUCTS.** Total sales of companies replying were up 5 per cent, exports being higher by 11 per cent. The estimated rise in 1958 sales is 11.7 per cent per company. Sixty-five per cent of the firms replying stated they had extended their facilities and all had introduced new products to their ranges since 1952.

Investment spending was up on a company average of: replacements 8.25 per cent, extensions 2.2 per cent, new plant 6.2 per cent, research and development 6 per cent. One company gave a total increase of 22 per cent, but did not show how this was spread under each heading.

Of those replying to the question, 65 per cent favoured the FTA, none were against the proposal.

● **PLASTICS.** The actual first-half 1957 sales increase of plastics materials was nearly 19 per cent. This represented a sharp recovery in the rate of increase which had slowed down in the early months of 1956. Sales in the period January to June amounted to 196,000 tons.

Exports in the same period totalled 52,500 tons, an increase of 18 per cent over 1956.

The rise in total sales was largely the result of increased turnover of thermoplastic materials, which were almost a third higher than in the first half of 1956. The most marked increases occurred in sales of polythene (up 40 per cent), polystyrene and vinyl chlorides, particularly plasticised sheet.

Sales of thermosetting materials were up 5 per cent, but turnovers in polyesters and epoxide resins, although only a small proportion of the total, continued to increase at much higher rate than other thermosetting materials.

● **MAN-MADE FIBRES.** The continued expansion of filament yarn output and a simultaneous contraction in production of staple fibre is disclosed by statistics issued by the British Man-Made Fibres Federation. The average monthly production of filament yarn from January to October was 19.76 million lb., or 4.53 per cent higher than the 1956 monthly average. Output of staple fibre, at a monthly average of 19.76 million lb., was down by 7.95 per cent.

Exports of filament yarn in the nine months, January to September, 1957, totalled 31.15 million lb., an increase of 38.6 per cent over the same period of 1956. Staple fibre exports for the first nine months of 1957 amounted to 16.62 million lb., a decrease of 20.7 per cent over January to September, 1956.

Our thanks are due to the many companies in the industry which have co-operated in the compilation of this material.

Prospects for Fertilisers

(*Continued from previous page*).

The resultant 'load' on driers is reduced if heated water, or better still, steam, is used in the wet-granule formation stage. Undersize and oversize material returned for re-circulation must be feed-regulated to avoid erratic disturbances of granulating conditions. The 'rolling' process for granule-formation requires more practical study, and newly designed cylinders may bring superior control, e.g., a new internal shape for the cylinder has been reported in America (A. Spillman, *Agricultural Chemicals*, 1957, **12**, 6, 42), this having 'looped' sectors, each giving a rolling movement.

The use of di-ammonium phosphate (DAP) for enabling high NPK-content compounds to be made is being favoured in some quarters (G. Burnet, *J. Agric. and Food Chem.*, 1957, **5**, 259). The US forecast is that wet-process phosphoric acid and ammonia will be used to make DAP rather than furnace acid as in the continuous crystallisation process devised by TVA (J. G. Getsinger, *et alia, ibid.*, 1957, **5**, 433). British use of DAP is known from manufacturers' statements, but no details seem yet to have been published. Another new 'raw material' developed for use in fertiliser solutions is TVA's 'superphosphoric acid.' This is produced by treating combustion gases from a phosphorus burner with water sprays in a hydrator. It has 76 per cent P_2O_5 content, in ortho- and pyrophosphate forms plus higher polyphosphates (*Chemical Engineering*, 1957, **64**, 137).

A disquieting report that organic fertilisers sold here are often infected with *salmonellae* has come from public health research (J. H. C. Walker, *The Lancet*, 1957, **6989**, 283); of 123 samples purchased, 50 were proved to be infected. The highest risk seems to be associated with bone-meal. Organic fertilisers whose processing involves a heat-treatment stage are less likely to be infected.

ABCM to give priority to FTA

(*Continued from page* 90).

one considers that our 'giant' company ICI represents less than half the capital employed in the industry, our readers will realise what a big total is involved among all members of the trade other than ICI in regard to capital employed and production of the country's goods.

I have described the attitude of the industry to the proposed European free trade area, and mentioned earlier the great change in the 1920's from a free trade economy to a protectionist one. We are now giving support and study to the idea of another big change in Britain's tariff policies. The US by its heavy protectionist policy has forced a dollar shortage on the world, which is undoubtedly a contributing factor to Europe's thoughts for a free trade area.

The chemical manufacturers in Great Britain are alive to the changes that may occur if European FTA treaties are made. There is a general appreciation that our programme of capital expenditure, research and development and market surveys, if adequate safeguards against unfair trading are assured by the British Government, will enable our industry with courage and foresight to enter such a scheme. We all know that a free trade area is aimed at the expansion of all industries in Western Europe, and we feel that the UK chemical industry can take an important part in that expansion.

ISOTOPES AND RADIATION ENERGY IN INDUSTRY

'Triggering-off' Chemical Reactions

AS the building of atomic power plants gains momentum more and more fission products will be available and their radiations may well play a very important part in industrial development.

The reasons why radioactive materials are of great benefit to industry are threefold. Firstly, radiations can be detected easily with modern instruments, and material can be marked or labelled with radioactivity for tracing purposes. The detection of materials is in many cases a million or so times better than by conventional analytical or spectroscopic methods. This has opened up research projects which could not have been envisaged before.

The second important type of application is based on the penetration or scattering of the radiations. Into this category fall the X-ray applications, as well as the instruments which have been developed for measuring thicknesses and as package monitors. Lastly, we have the effects of the radiations themselves which can be used, particularly their ability to ionise air or other gases, or as in the case of massive radiation (irradiation with big sources) they will be able to kill bacteria, change chromosomes, start chemical reactions, influence catalysts or pasteurise foods.

There is no doubt that industry today is making wide use of radioactivity and in fact one hardly buys a finished product which has not seen, at least from a distance, a radioisotope in some form for process control. But this is only the first step in the very exciting story of the development of use of radioactive materials in industry.

Fantastic Quantities

Fantastic amounts of gamma-emitting materials will be available to us for the first time in years to come. Scientists of many countries are busy finding uses for this entirely new source of energy. Many atomic power stations will be built in the future and the gamma-energy locked up in these stations will be enormous. Something like two per cent of the power of an atomic station could be available as radiation. If our reactor engineers have overcome the first difficulties of building power stations, they may well look into the matter of building such stations in the future with a view of using the locked-up radiation energy. In the meantime, we have the choice of using either used fuel rods of conventional power stations, a not very exciting thought because of difficulties of transport and cooling, or we may use one of the long-lived fission products after they have been separated. Here, caesium 137 may become the most important isotope,

Dr. HENRY SELIGMAN, head of the Isotopes Division, UK Atomic Energy Authority, on whose notes this article is based.

and plans are on foot in several countries to extract this element.

However, we must realise that the supply of caesium will not be unlimited, even in the future. We must be aware that for each thousand megawatts of heat produced in an atomic power reactor, one obtains only of the order of one megacurie of caesium 137 per year. According to this we can see that in a country like the UK it is unlikely that in the next 20 years more than hundreds of megacuries of caesium will be produced per year. If bigger sources are needed then one has to fall back on the gamma energy in reactors. Until, however, caesium becomes available in bigger quantities, which we do not expect to start before 1960, bigger cobalt 60 sources will have to replace them, although there is no doubt that, ultimately, from 1965 onwards, caesium will become a very cheap source of radiation energy.

Different Types of Use

Radiation energy is being envisaged for such vastly different types of applications that the source strengths required are spread over many magnitudes. While potatoes may be irradiated in order to prevent sprouting, with doses of less than 10^4R the vulcanisation of rubber will need something like 10^6R. Here we see that we have a wide field of radiation doses needed and that in the future small sources as well as big sources like reactors will have to play their part.

From the point of view of radiation production I foresee the future as follows. Machines like Van de Graaff's or linear accelerators will be used when small volumes have to be irradiated with relatively high doses. Caesium, cobalt or fission products generally will be used for all main applications where a dose does not exceed 10^5 to 10^6R. For higher radiation doses and large-scale production in that region, the gamma-rays from reactors will have to be used. I foresee that the fission products will have to be circulated outside the reactor itself and their gammas will be used in a factory attached to the reactors to do the job, as in the vulcanisation of rubber tyres or other chemical changes where high doses are needed.

We must not forget that the whole research and development of the use of radiation energy is in its infancy and some countries have started to make a serious effort to solve some of the problems which occur. In the UK we are concentrating all radiation sources on one site where scientists from industry and the UK Atomic Energy Authority are working side by side to solve these problems. Let us take a look into the crystal ball and see which fields look most promising for radiation energy to play its part.

Industrial Applications

There are many industrial processes in which radiation might be used on an industrial scale ranging from processes where the physical properties of a material are altered by radiation to those in which complete syntheses can be carried out. We might first consider some important physical changes which can be produced by irradiating various materials. Radiation might help in two ways, firstly by modifying the properties of the finished polymers and secondly, when used in the manufacturing process, by actually producing a polymer with superior high temperature properties. An example of the first application is the effect of radiation on polythene. This material normally melts at approximately 110°C. At 100°C its tensile strength is reduced and pipes made of this material cannot safely be used with boiling water under pressure. Irradiation of polythene with a dose of between 5×10^7 and 2×10^8 roentgens prevents the material from melting and as the temperature is raised it merely softens. Already it has been found that irradiated polythene cable can be used at temperatures of 140°C to 150° C. Some financial saving may accrue from the use of irradiated polythene cable since more current can be passed through the conductor without melting the insulator.

The second way in which the use of radiation may be of importance is well illustrated by the use of radiation of the vulcanisation of rubber. Chemical vulcanisation using sulphur is one in which the rubber molecules are joined together by sulphur atoms. Radiation has a similar effect on rubber in that it too can cause these molecules to join together by carbon-carbon bonds, no sulphur being necessary. The high temperature properties of the material are markedly superior to those obtained when the rubber is chemically vulcanised. For example, embrittlement of some acrylate rubbers takes place in eight hours at 350°F with the chemically vulcanised material, but does not occur until after 36 hours with the radiation vulcanised material.

There are, of course, many other

ISOTOPES IN INDUSTRY

chemical reactions which can be triggered off by radiation. Among the most important of these are ones in which one active molecule causes the reaction of a large number of inactive molecules. These reactions are known as chain reactions and are usually employed in polymer production. In this case, active molecules are added to the inactive molecules in the form of a catalyst. Using radiation, however, active molecules can be produced from those which are normally inactive, and as a result polymerisation induced by radiation can often take place under physical conditions which are quite different from the normal catalyst process.

For example, polymerisation of ethylene to produce the plastic polythene used to make household articles is normally carried out at a pressure of over 1,000 atmospheres and a temperature of 200°C. If radiation is used to initiate the reaction, polymerisation can be carried out at pressures very little above atmospheric and at ordinary temperature, and the process yields a product which is rather tougher than that produced in the high-pressure process.

This is just one example of the way in which the use of radiation leads to a product differing from that normally obtained. In many cases the products have superior properties. This field, of the initiation of chemical reactions, is one in which a considerable amount of work is being carried out.

Sterilisation Procedures

Opportunities for the industrial use of radiation in sterilisation procedures are very great. Provided that a sufficiently large dose is given, radiation can kill most forms of living organisms. Doses, of this order, can be easily administered to drugs and it can be shown that the total chemical change in the drug produced by this radiation is almost negligible. A further advantage is that the delivery of a dose of this magnitude to a drug results in a rise in temperature of only 1 or 2°C. Hence any damage to the product which might occur on heating is entirely eliminated. Heat sensitive drugs which, at the moment, are sterilised by filtering off the bacteria followed by aseptic subdivision of the bulk solution are therefore easily sterilised by radiation. The filtration method does not eliminate the possibility of chance contamination taking place during the aseptic sub-division, whereas radiation sterilisation can be carried out in the final package. In fact, it offers the same degree of sterility as heat treatment affords with materials which are not thermally sensitive. Already it has been shown that antibiotics such as penicillin, streptomycin, aureomycin and Tetracyclin can be sterilised by radiation without any loss of potency.

Inactivation of a virus to produce vaccine must be carefully controlled, so that its infectivity is destroyed without seriously reducing the antigenicity, which is the power of the inactivated virus to stimulate the generation of antibodies in the patient. Inactivation is most commonly carried out by chemical means, but in many cases the margin between successful inactivation and reducing the antigenicity of the vaccine is narrow. There is some evidence to show that radiation-induced inactivation can be achieved without the same relative damage to the antigenicity.

There are many ways in which atomic radiation may be used to help in the preservation of food. Perhaps the simplest of these, and one requiring a small dose, is the prevention of sprouting of potatoes. The lowest doses appear to delay the sprouting only and are being considered as a means of extending the marketing areas of seed potatoes to such places as South Africa and Australia. One of the early experiments showed that potatoes irradiated were more susceptible to damage by bruising because the potatoes had lost their power of healing. However, if the potatoes are allowed to rest a few days before treatment, their skins are already hard enough to enable them to stand up to normal handling.

Radiation treatment to kill insects is being investigated, as also for a range of packaged food products, including spices and dried fruits.

Storage Life

Storage life of bacon, ham and sausage can be increased up to four or five times by a light dose of radiation, and increases of this kind could make a material difference to the economics of distribution of these articles. Attempts to increase the storage life further bring in their train the problem of new and sometimes unpleasant taste and flavour changes in the food. A great deal of experimental work is going on, especially in the US, in an endeavour to minimise these secondary unwanted effects. One approach is the combination of radiation treatment with light cooking or the addition of antibiotics which are destroyed by later cooking. In the normal practice of sterilisation by heat, many canned meats are cooked beyond the degree required for maximum palatability and it is hoped that by using radiation sterilisation for at least part of the process it will be possible to make the product more attractive.

Before any of the irradiated food products can be offered to the general public, a good deal of testing of the irradiated materials will be necessary.

Huge New Sources

As we have seen, the application of radioisotopes as small sources in industry is widespread, and radioactivity is being used as a method of process control as well as a research tool. Radiation energy in the form of huge sources of beta- or gamma-emitters, which may become available within the near future, are being tested for their usefulness to industry in many countries. Quite apart from the speculative developments mentioned here, there are still some which might revolutionise an industry, as for instance, the influence of radiation on certain chemicals which may have an unforeseen effect, and may be the starting point of a new chemical industry.

Looking at all these possible projects, we have so many good horses in our stables that some of them are bound to win, and therefore the so-called 'waste products' of atomic energy will be greatly sought after by industry in the next five or 10 years. In fact, there may be a serious shortage of radiation energy, and the earlier we can muster all available gamma energies as cobalt sources, separate fission products or unlocked neutron-free gamma rays in reactors, the nearer we are to fulfilling the demand which industry is bound to make within a few years.

PETROCHEMICALS—1957 and after

(*Continued from page* 93)

xylenes, in relatively large volumes. Para-xylene requirements are growing with the increasing output of Terylene polyester fibre and since insufficient xylene is available from coal tar sources, petroleum has supplied and will continue to supply, the necessary quantities. The future availability of low-cost ortho-xylene could lead to its use for phthalic anhydride (7) production in place of naphthalene as at present.

The consumption of synthetic rubber is increasing steadily in the UK and as may be seen from Table 4, new plants for the manufacture of synthetic rubber are scheduled for construction. Although GR-S rubber represents a large part of synthetic rubber requirements there is a growing consumption of butyl rubber and Esso Petroleum Co. have stated that they will erect plant for manufacture of butyl as soon as demand justifies UK production.

These possible outlets and many more not yet explored will ensure that the petroleum chemicals industry will have a bright and expanding future.

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ANNUAL REVIEW & 1958 PREVIEW

Rate of Chemical Exports Rise Doubled in 1957

By George Brearley, B.Sc., F.R.I.C.

Director, Association of British Chemical Manufacturers

THE year 1957 brings to an end the first decade, during which the British chemical industry has directed its efforts to the task of building up a major direct export business in addition to continuing that of supplying the basic needs of other industries.

Before reviewing the export achievements of the present year and the prospects for 1958, it is of interest to consider the developments which have occurred since 1947 when the Board of Trade, in launching the post-war export drive, set the chemical industry a target of £96.6 million per annum by the end of 1948.

As a result of research work initiated in the chemical industry, sections of it have developed to the point of becoming to be regarded as industries in their own right. Plastics, synthetic fibres, synthetic detergents and crop protection products are examples of this trend. The large number and wide variety of the products manufactured which are constantly increasing do not permit of the simple tabulation of the growth of chemical exports in terms of physical quantities. With such a constantly changing background, it becomes increasingly difficult accurately to define the chemical industry and hence to isolate the available statistical data which would permit a true assessment of the trends in direct chemical exports.

Nevertheless, the following tabulated data, derived from the Trade and Navigation Accounts, give a reasonably accurate general picture, provided that it is appreciated that, up to the year 1952, these official figures refer to Class III, Group O products and subsequent to that date to Class D, Division I products, which means that, from 1952 onwards the figures are enhanced by the inclusion of plastics materials, perfumery and toilet preparations, essential oils, soaps and explosives. Under the old computation the figure for 1952 was £138.7 million and under the new computation £184 million.

The original target figure was passed in 1950 and, except for a slight recession in 1952, exports have continued to increase steadily year by year since 1953, until they are at present running at a rate of £267.1 million per annum.

This places the chemical industry third in the list of British exporting industries, a position it achieved several years ago which has since been maintained. During this building-up period the industry as a whole has invested £500 million in the development of new factories and plant.

Concurrent with this expansion in the UK, Germany has been making strenuous efforts to regain her former dominating position in the world chemical export trade; the US, as a result of the rapid development of her chemical industry during and since World War II has become an important factor in the chemical export field, and other countries have been undertaking the creation or extension of their domestic chemical manufactures. The development of major export markets for British produced chemicals has, therefore, taken place during a period in which the major competing countries have been making similar efforts and several erstwhile customer countries have been carrying out schemes designed to reduce their imports of chemicals. It is therefore of interest to note the trend in the annual rate of increase in the export of British-made chemicals over the past five years:

Year	1953 = 100	Rate of rise of UK chemical exports by value %
1953	100	—
1954	114.8	14.8
1955	130.7	14.3
1956	137.8	4.9
1957	150.5	9.2

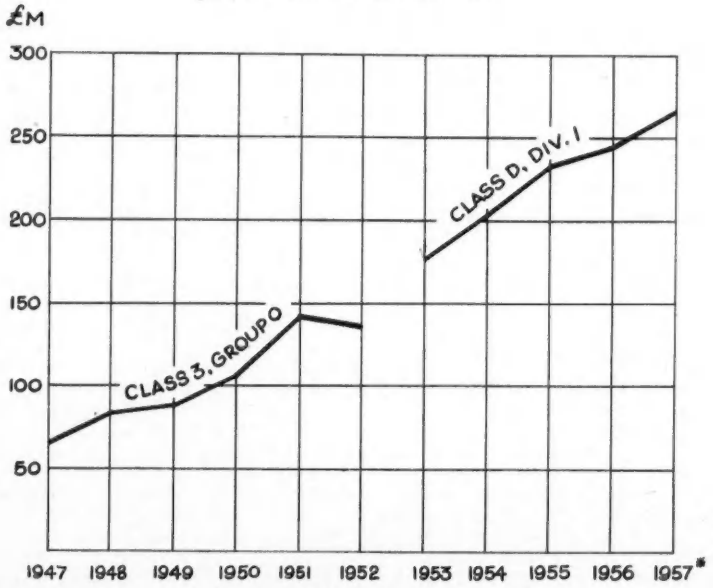
As to be expected the annual percentage growth rate has tended to fall over the past four years during which the actual value of the exports has been increased by 33.5 per cent at an average rate of 8.4 per cent per annum.

Changes in Pattern of Exports. Before the last war, the UK had come to be regarded mainly as an exporter of such heavy inorganic chemicals as soda ash, caustic soda and the salts of the heavy metals but also dyestuffs. The post-war period has, however, shown a striking and significant change.

The remarkable growth of the synthetic organic chemical industry, particularly in the production of products based on petroleum and carbide acetylene, has had a marked effect on the pattern of chemical exports. A petrochemicals industry, second only to that of the US, has been established, the importance of which is reflected in the continued growth in the exports of plastics materials. The development of the manufacture and the building up of an export trade in antibiotics has been another outstanding achievement which has now ranked these products high on the list of our principal chemical exports.

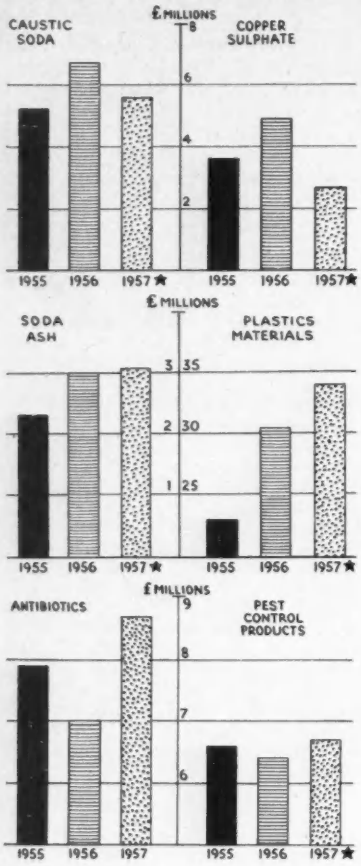
The significance of the above trends is readily seen in the following tables:

[Exports of Chemicals 1947—1957



* 1957 is estimated from the results achieved in the first ten months

Some Principal Chemical Exports



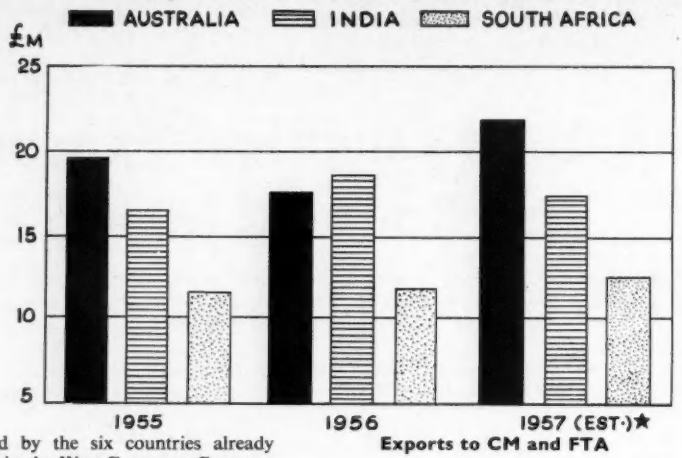
* *Estimated*

Before considering in detail the changing pattern of chemical exports as regards country of destination it should be noted that Australia, India and the Union of South Africa, despite the developments of their internal manufacture, still account for approximately 20 per cent of the total UK total exports in chemicals (table top right).

Distribution of Exports. In view of the present discussions on the proposed West European Free Trade Area it is of interest to consider the export trends in the markets represented by the six countries already associated in the West European Common Market, the countries likely to be associated in a European FTA, the Commonwealth countries and the countries in the dollar area.

The overall UK world picture during the past three years has been that the sterling area has accounted for approximately 50 per cent of the world total and the dollar area approximately 9 per cent. The non-sterling OEEC countries and their possessions have accounted for approximately 27 per cent. The actual values in £ million and the percentages of the UK world total have been as follows:

Exports to Three Commonwealth Countries



Exports to Common Market

	1955 £m	1956 £m	1957 * £m
Belgium	5.2	6.1	6.6
France	6.6	7.7	8.7
Germany	5.6	6.2	8.5
Holland	7.8	8.9	10.1
Italy	6.3	8.8	8.9
Total	**31.5**	**37.7**	**42.8**
% of UK World Total ...	13.5%	15.4%	16.0%

Exports to Potential FTA

	1955 £m	1956 £m	1957 * £m
Austria	0.9	1.1	1.3
Denmark	3.9	4.6	4.7
Greece	0.9	1.3	1.0
Irish Republic	6.7	6.6	6.6
Norway	3.3	3.7	4.2
Portugal	1.7	2.1	2.6
Sweden	6.1	6.7	7.2
Switzerland	2.5	3.2	3.2
Turkey	1.6	1.2	1.2
Total	**27.6**	**30.5**	**32.0**
% of UK World Total ...	11.8%	12.4%	11.9%

Exports to CM and FTA

	1955 £m	1956 £m	1957 * £m
Common Market Countries	31.5	37.7	42.8
Other Potential Entrants	27.6	30.5	30.2
Total	**59.1**	**68.2**	**74.8**
% of UK World Total ...	25.3%	27.8%	28.0%

Exports to Commonwealth

	1955 £m	1956 £m	1957 £m
Sterling Commonwealth	64.7	64.2	76.1
UK Colonies	36.4	37.3	33.7
Canada	7.8	8.3	8.3
Total	**108.9**	**109.8**	**118.1**
% of UK World Total ...	46.7%	44.9%	44.2%

* *Estimated on 10 months performance*

Distribution of UK World Exports 1955—1957 in £M

	1955 Value	1955 World Total %	1956 Value	1956 World Total %	1957 * Value	1957 * World Total %
Sterling Area						
Total	117.5	50.4	118.3	48.4	131.2	49.1
Sterling Commonwealth ...	64.7		64.2		76.1	
UK Colonies	36.4		37.3		33.7	
Middle East	16.4		15.5		17.0	
Non Sterling OEEC Countries and Possessions						
Total	58.5	25.1	67.1	27.4	73.6	27.5
ECSC Countries	31.7		37.7		41.8	
Scandinavia	15.0		13.4		15.8	
Dollar Area						
Total	21.9	9.4	23.8	9.7	22.5	8.4
US	7.6		9.6		7.3	
Canada	7.8		8.3		8.3	
Dollar Latin America ...	5.9		6.2		6.4	
Rest of World						
Total	34.7	14.5	35.0	14.3	40.0	14.9
Non-Dollar Latin America ...	8.0		8.6		11.2	
Soviet Eastern Europe ...	1.3		2.2		2.9	
UK World						
Total	233.0		244.5		267.1	

*1957 estimated on basis of 10 months actual achievement.

From a consideration of these various tables the following trends in the distribution of UK chemical exports are discernable. Over the past three years total UK world exports have increased in value by 14.6 per cent, exports to the potential European free trade area countries by 26.5 per cent to the British Commonwealth countries by 7.7 per cent and to the dollar area by 8.4 per cent. Expressed as percentages of total world sales the picture is, however, that whereas the potential FTA countries show an increase of 2.7 per cent the British Commonwealth and dollar area show decreases of 2.5 per cent and 1.0 per cent respectively. These already discernible trends are not without significance when considering the relative merits of the proposed European FTA and the British Commonwealth as potential markets for the continued future expansion of British chemical exports.

Future Prospects. Heavy capital investments in the British chemical industry still continue and as further projected new plants come into production the output of chemicals will continue to rise markedly. Output of chemicals rose 3½ per cent in 1956 and showed an increase of over 6 per cent in the first six months of 1957.

The principal increases in exports in 1957 as compared with 1956 have been to Australia (£3.6 million), to West Germany and the Argentine (each £1.9 million), Iran and Burma (each £1.2 million) and France, Netherlands and New Zealand (each £1.1 million). Countries showing

(*Continued on page* 103)

URGENT NEED FOR REAPPRAISAL OF SALES PROMOTION TECHNIQUES

Sir Miles Thomas Discusses Problems of European FTA

THE BRITISH CHEMICAL INDUSTRY is a giant with a hoarse voice. It has not been distinguished in the past for publicising itself either at home or overseas. Yet as the third largest exporting group in this country it has something worth shouting about. And with the possible formation of a European free trade area, it is time for the industry to clear its throat.

Now more than ever before there is an urgent need to reappraise the industry's sales promotion techniques. More vigorous publicity practices are demanded to meet the challenge of the changing tempo of world business generally and European business particularly. In addition, we need to pay far closer attention to our marketing and market research methods if we are to compete successfully in the FTA.

All this is, of course, generalisation and, as such, has its limitations. The industry's interests have always been well served by the marketing and publicity efforts of a small minority and it has given good account of itself in the face of the volatile and rapidly changing trading conditions prevailing hitherto.

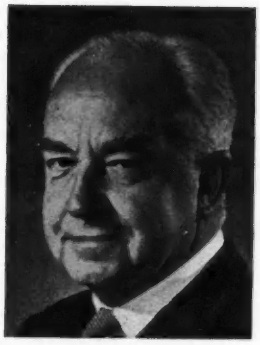
What we have to face up to now is what will theoretically become, in the course of time, European marketing and selling conditions which will be more sharply defined and open to a more intensively planned pattern of sales promotion; and that these conditions will apply equally to our overseas competitors as well as to ourselves.

Must Have Broad Plan

Any discussion of the problems can, at this stage, be only of a general nature. Nobody is in possession of all the facts—nobody, indeed, yet knows just what the FTA means; nor are we sure when it will come about. But we must be ready for it, and have the broad plan of our movements mapped out.

The keynote of success in the FTA will be: ATTACK. Do not misunderstand me. In preparing for the trade barriers of Europe to be raised, gearing to meet increased foreign competition in this country will be equally as important as gearing to make greater sales efforts in Europe. But—the more we sell in Europe, the more difficult will the overseas competitor find it to sell here.

One reason is that the more vigorous we are in selling abroad, the more time and resources will he have to spend in competing with us there, on his home territory: he will have a greater respect for our selling ability—and he may think twice about attempting to compete with us on *our* home territory.



SIR MILES THOMAS, D.F.C.
Chairman, Monsanto Chemicals Ltd.

Obviously, it will be easier to meet the challenge of the FTA if one is already established there, preferably by having one's own sales office, or, secondly, by having first-class agents, or—and this is the minimum requirement—by having representatives visiting Europe frequently. The offices and the agents' offices must be staffed for the most part by nationals of the country concerned, the visiting representatives must be acquainted with the language and the customs. This question of being well-represented locally in Europe, and of being *well-locally* represented, will perhaps be the most important of all. We must realise that we cannot transfer British standards overseas. Each country thinks that its own customs, its own standards are the best; if, therefore, we want to sell to other countries we must meet them not only on their own ground but on their own terms. For, to sell in the FTA, we can no longer afford to be regarded as Britons or Frenchmen or Germans: we will all be Europeans and we will have to behave as such if we want to sell our goods to each other.

All this may sound too obvious, but we in this country have a tendency to forget the obvious simply because it is so. There are still too many British firms advertising in foreign languages by simply having their English-language advertisements translated. This will never do. Advertisements for overseas markets must be tailored to fit these markets. Translations are of little value; adaptations are needed, and most often these have to be complete rewrites.

Of course, I am fully aware of the difficulty of obtaining good adaptations as opposed to good translations, but that is a difficulty which has to be overcome.

One solution may be to make sure that your representative on the spot is consulted. Better than you, he can probably adapt your advertisement to suit the country or find a local agent who can adapt it.

We must not forget, however, that advertising agents overseas are not necessarily the same as advertising agents in this country: they may have sidelines to their business—such as space-selling—that may influence their outlook as advertising agents. Nor must we forget that the pattern and standards of publishing in some countries are not always the same as those in this country. We must not expect to find in every other country a profusion of trade and technical magazines, with their accompanying advertising columns, on the scale that we have them in Britain.

All this means that we have to take a much closer look at the problems involved in advertising the British chemical industry in Europe. Since there is less scope for press advertising, we must consider more strongly the use of direct mail or even of travelling exhibitions. But always the first consideration must be the customs of the individual countries concerned. There is no value in having a big direct mail drive in a country with a poor postal service, or running a travelling exhibition in a land whose communications are below a satisfactory standard, or planning a big national press advertising campaign in a country whose newspapers are national in name but regional in circulation.

Along with this individual approach, we must have a more realistic approach to market research activities. This is one of the big problems in Europe, where statistics are not always available and, even if they are, are often incomplete.

At present the Association of British Chemical Manufacturers is among the leaders in making enquiries into the possible effects and needs of the FTA, and it deserves to be congratulated for the excellent way in which it is making its information available. It is doing a remarkably good job in a remarkably difficult field.

To supplement this, the industry may now need to think about some corporate form of publicity. In some industries, such as the motor car industry, the individual firms maintain their own vigorous, hard-selling publicity campaigns: but the industry as a whole plays a vital role in publicising its interests generally—for instance, by stressing the need for newer and better roads. The milk industry and the steel industry run general advertising campaigns. The chemical industry, however, does very little if any-

(*Continued on page* 106.)

Viewpoint on Free Trade

SWEDISH CHEMICAL INDUSTRY'S 'SOMBRE OUTLOOK'

HARDLY any topic has occupied the minds of executives in Western Europe during the last year to the same extent as the plans for closer European integration, which now have taken a few steps towards a more materialised state. The reactions among executives to these plans run from feelings of deepest pessimism to those of confident optimism, depending on their likely impact on the executive's own firm. No exact sounding of those feelings has been made in our association, but there is no doubt that in it is represented the whole scale with some dominance for the more sombre outlook.

Let us assume that a convention for a free trade area (FTA) has been signed by the 17 OEEC countries—including Sweden—and that this convention has safely passed the 'purgatory' of parliamentary ratification. What then would be the situation for the Swedish chemical industry? For a country which has a very moderate tariff wall like this one, it could seem advantageous to obtain free access to markets in Europe which have long been protected by high tariff walls. However, if an industry in such a country is comparatively small and mainly directed towards the home market, which is the case for our chemical industry, increased foreign competition on this home market might well outweigh any advantage on the export side. And those advantages on the export side could prove to be somewhat chimerical. Indeed very much will depend upon the fact whether trade in the FTA becomes really free and fair.

Origin of Goods

One of the thorniest problems to solve in a FTA is the question of the origin of goods that will benefit from the non-tariff treatment. This is a typical subject for the FTA and it is a consequence of the right, which participating countries retain, to fix individually their tariffs against third countries. And this in turn will result in rather considerable differences between the moderate tariffs on, for example, basic materials in the small FTA countries and the sometimes remarkably high EEC tariff. Some continental high tariff countries claim that such differences in tariffs could create a deflection in the pattern of trade and give what is supposed to be an unfair competitive advantage to the low tariff countries. They fear that third country materials could enter the FTA via a low tariff country and compete with products produced within the area. In a FTA there is no panacea for this problem; a compromise solution has to be sought and found and we can never expect this solution to satisfy all the 17 countries.

But even if the compromise solution to the rules of origin in the FTA could *prima facie* look acceptable to us, very much will depend on the application of such rules. The much feared problem concerning 'deflection of trade' might well in practice be replaced by the not less severe problem of 'restriction of trade.' A bureaucratic administration of the system with certificates of origin could become a source for serious irritation in a FTA. That is why there are many representatives of Sweden's chemical industry who consider that the best solution to the problem for this country would be to raise our tariffs, at least on raw materials and semi-manufactures, up to the EEC level. There would then no longer be any reason to investigate thoroughly the origin of Swedish chemical exports, except for pre-transit trade. This might in the long run prove to be of more importance for such exports than any supposed competitive advantage, derived from low outer tariffs on raw materials. The general attitude towards such an increase in tariffs is, for obvious reasons, hostile and it will not fail to have some negative impact on the home market, but experience may prove that in the choice of two evils, this will be the lesser.

An attempt to summarise the likely effect of the FTA on Sweden's chemical industry is hard guesswork. My personal feelings are that the immediate disadvantages, in particular during the transitional period, will slightly outweigh the positive factors. Nevertheless the prevailing attitude in this industry is not against an adherence to the FTA, and this attitude is then dictated by other reasons than the immediate impact on the chemical industry.

The above points have been raised on the assumption that FTA has come into being. It is anyone's guess whether such a situation will ever occur. If the FTA does not materialise, what then? We are left with a Europe split into two parts, where the centre will develop into a protectionist block with a high competitive export power, not least in chemicals. It is an open question whether some form of economic co-operation between those OEEC countries which do not join the EEC, could diminish such destructive effects on a divided Europe.

HERMAN LUND
Chairman,
Association of Swedish Chemical Industries. Chemical Section,

UK Chemical Ware Makers See Danger in Loss of 'Know-how'

MEMBERS of the British Chemical Ware Manufacturers' Association are by no means unanimous in their attitude towards the proposed free trade area. They are all concerned with the production of materials which are covered by the Safeguarding of Industries Act (Part 1) of 1921 and imports have been subject to the provisions of this Act. They would all welcome an opportunity of doing business on the Continent of Europe and some are already exporting their products to several of the countries that will be included in the free trade area. They are not afraid of fair competition.

On the other hand some of our members believe that there will be no adequate means of preventing unfair competition by certain firms abroad and in cases where the business is a very restricted one and confined chiefly to the home market they have no confidence in the means of assuring fair play which have so far been made public.

H. Lund

N. Sheldon

Although the majority of manufacturers of other products subject to Key Industry Duty are prepared to accept the proposals for the gradual elimination of the duties there are others who share the views of our members who are opposed to the free entry of materials which are made in very small quantities but which are essential to the technical progress of the nation because they are made by workers who acquire specialised skill and information which enables them to assist many important and major industries in their research and technical advancement.

The Government do not appear to be aware of the importance of maintaining the manufacture of certain technical products in this country in order to preserve the 'know-how' which has been acquired under protection of the duties referred to. This 'know-how' could easily be lost if there is no control over the actions of unscrupulous manufacturers who are quite prepared to dump goods here in order to gain complete control of the British markets. No anti-dumping regulations that are likely to be operated by any British Government are of any value to the kind of industry in which some of our members are engaged and it is felt that more careful consideration by the present Government should be undertaken before we are finally committed.

NORMAN SHELDON
Chairman.
British Chemical Ware Manufacturers' Association.

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CHEMICAL INDUSTRY PROSPECTS IN THE YEAR AHEAD

New Products May Help Profit Margins

THE year 1957 was one of continued general prosperity, though there were recurrent economic crises throughout the year, and the effects of these will be felt long into 1958. Much of the trouble stemmed from the Suez crisis at the end of 1956—though the pessimistic estimates prompted by Suez were much worse than the actual outcome. Inflation has continued to be the main bogey, though it was checked for a while in the early part of the year. It was one of the two reasons for the Bank Rate rise and the intensified credit squeeze which the Government introduced in September.

The immediate object of the September measures—namely, reducing pressures on sterling—was attained, but it is still too early to tell whether the measures will achieve their longer term aim of halting inflation. They were neither sufficiently drastic nor sufficiently quick-acting to have immediate effect, but some reduction in industrial production seems likely in the early months of 1958. In fact, even before the monetary restrictions were introduced, there were signs that total industrial production might soon stop rising.

Third Quarter Trends

Provisional figures for the third quarter of 1957 show that the rate of increase of chemical output had also already tended to slow down. It is, however, only a reduction in the rate of increase, not an absolute fall: chemical output was 3 per cent higher in the third quarter of 1957 than in the third quarter of 1956, while output was 6 per cent higher in the first half of 1957 than in the same period of 1956.

Unhappily, the main feature of the economic outlook for 1958 is uncertainty. It is now generally accepted that the course of future events—both at home and abroad—hinges upon the wages problem. Though there are high hopes—and a good chance—that wage increases will be small—say 2 to 3 per cent on average—the possibility of greater increases and the danger of industrial unrest remain. How soon the Government can relax its tight money policy depends on the outcome.

It is possible to be both more definite and more confident about the position of the chemical industry in 1958. Though production will be hampered by the credit squeeze, it is felt that only the rate of increase will be damped down—not total output. There has been considerable capital expenditure over the last few years in the chemical industry and consequently greater output and productivity should result, as development schemes reach fruition. Current investment is restricted, but the research and development schemes are essentially long-term and so will not be seriously affected or disturbed by the short-term restrictions. Long-term prospects are, therefore, favourable, particularly for petrochemicals and those sectors of the industry where Britain has the advantage of large scale production and technical experience.

Profit margins are, however, likely to be squeezed during 1958 in view of possible wage demands and increases in other costs. This outcome is decidedly uncertain. The interim report for ICI which showed an increase in profit margins—contrary to most company reports of previous months—has raised hopes that the 1956 trend towards lower profits has been reversed. The ICI results are evidence of the way in which trading profits have benefited by sales of new products which have been exploited so successfully in recent years. It is hoped that trading profits will continue to reflect the successful exploitation of new products and better methods of manufacture.

By the Economist Intelligence Unit

Export sales show an increase of 9 per cent for the first eleven months of 1957 over the same period of 1956. Competition in all overseas markets is increasing, particularly from Western Germany, but there is no reason to expect any contraction in these markets during 1958. British manufacturers should be able to maintain their share of the ever-increasing world market for chemicals even though demand is growing most rapidly in highly developed countries, such as those of Western Europe, where British goods have to meet with stiff Continental competition.

Recently, there has been considerable discussion regarding the setting up of a free trade area in Europe. It is sufficient to mention here that great opportunities await the efficient branches of the chemical industry in this event. The importance of the question of mergers between firms, brought out by the recent proposed merger between British Chrome and Chemicals (Holdings) and Brothertons, will be considerably enhanced if an FTA is set up.

Any merger implies that shareholders will gain the economic benefits of rationalisation and co-ordination of similar business, while, as in the above example, if interests are not identical, the new concern will enjoy greater stability through the spreading of financial risks over a wider range of products. The more immediate effects of mergers on shareholders of the participating firms will naturally depend primarily on the basis of the merger. Terms are usually based on the market values of the shares, giving due consideration to asset values and to development schemes in progress. As in the case quoted above, shareholders will initially be little affected by the merger, though a merger is frequently to the benefit of the smaller firm.

Mergers also offer great opportunities for concentrating research on some particular product, combining technical experience, skill and finance. Research and development are tremendously important to all industries and in particular to the chemical industry where the phenomenal expansion of the last few years is due largely to the development of new products. It is not, therefore, surprising to learn that the chemical industry, in devoting rather over 2 per cent of the value of its production to research and development over the past few years, has more than doubled the proportion spent by industry as a whole.

It is impossible to distinguish between research and development in these figures, but, if anything, more attention has recently been paid to research. The number of qualified scientists engaged in chemical research in 1956, at 4,000, represented an increase of 33 per cent over the 1948 figure, while inflation and the greater capital investment required for research have pushed the cost per scientist-year up by 60 per cent over the same period. It seems that only the larger firms have the resources to meet increases of this order.

Bright Outlook for Chemical Exports

(Continued from page 100)

the principal declines have been Egypt (£2.87 million) and US (£1.2 million).

From the point of view of the principal products, drugs, medicines and medical preparations have shown an increase of £3.7 million, plastics materials £3.3 million and antibiotics £1.9 million. The products showing a decline as compared with the previous year have been copper sulphate (£2.1 million) and caustic soda (£1.1 million).

As to probable trends in 1958, it may be anticipated that it is in the drug and medicine and plastics sections that the continued growth in exports is to be expected. In general, world competition is increasing in severity and prices are becoming keener which means that sales efforts are having to be stepped up to retain, much less increase, the volume of direct export sales.

In the long term it would appear from the analysis of recent export achievements that the chemical industry can, on balance, look forward with reasonable confidence to the establishment of a European free trade area as a means of extending her export trade.

At the moment, the present unresolved factors in international politics and home problems concerning the stemming of inflation make forecasting of the future export position a more than usually hazardous task at the turn of the year.

The industry with its excellent record in increasing its standard of productivity, its progress in research and its large capital investments in new plant and equipment, can look forward to the future export prospects with confidence.

SCIENTIFIC DEVELOPMENTS OF 1957

Sir Alexander Fleck's Review in Inaugural Address as British Association President

1957 is strongly associated in the minds of many followers of science with the beginning of the International Geophysical Year. The advancement of technology has probably never been so clearly demonstrated to the whole world as when the first artificial earth satellite was successfully launched from Russian soil early in October. The appearance of something which could be described as a 'new moon' was a technical achievement which those on this earth with almost negligible claims to literacy could appreciate.

This event, closely followed by the launching of 'Sputnik II', dominates the IGY, and is the first experiment of a type which will undoubtedly add to man's knowledge of space much that our atmosphere has prevented us from discovering before. It should not, however, detract from the other advances which have been made in the study of conditions beyond the outer confines of the atmosphere. Some of these events can at present only be assessed as technical achievements—the American manned balloon which reached a height of 20 miles, the rocket which soared to some 4,000 miles, the aluminium pellets some of which are surmised to have been consumed by the sun.

There is one science in which the British contribution to the IGY has been of paramount importance during 1957, and that is radio-astronomy. At Jodrell Bank Professor Lovell has been obtaining the first results from the largest steerable pencil-beam type of radio-telescope in the world;

The other notable British achievement in radio-astronomical research has been the construction of the new interferometers(2) at Cambridge. One of these instruments is intended primarily for the study of radio-stars and another will be used to investigate continuous radiation from our Galaxy.

In his presidential address to the British Association in 1951, the Duke of Edinburgh referred to the development of teamwork which had contributed so much to science during the previous 100 years; seldom has this been so well epitomised as in the geophysical research of 1957. Oceanographers, polar explorers, glaciologists, meteorologists, nuclear physicists, seismologists, astronomers are all combining their contributions to the structure of our knowledge;

Nuclear and Theoretical Physics. It is probably in the field of nuclear and theoretical physics that the next most significant advances have been made. The award of the Nobel Prize for Physics to Yang and Lee has called public attention to the law of conservation of parity, the universality of which was disproved early last year at the National Bureau of Standards in Washington and at Columbia University.

The discovery of the 102nd element, nobelium, is another announcement made during 1957. It is the first man-made element to be discovered in Europe, and it provides another instance of international team-work. The method of preparation was to bombard curium-244 with nuclei of carbon-13, which were accelerated in the 225-cm. cyclotron in Stockholm. Since the half-life of the resulting isotope was only about ten minutes, considerable ingenuity was required to identify it.

Several significant events have occurred in this country during 1957 which relate to the production of energy. The Harwell nuclear reactors known as 'Pluto' and 'Neptune' have both been started up, and we can expect that the latter will provide much valuable information about the design of reactors for marine propulsion; the need for careful design has been only too strongly underlined by the Windscale accident.

Sir Alexander Fleck, chairman of Imperial Chemical Industries and president of the British Association

Of more far-reaching significance, however, is the brief announcement that Dr. Thonemann's team at Harwell have apparently succeeded in conducting a controlled thermonuclear fusion in their quartz torus known as 'Zeta' II.

Chemistry. In considering the production of energy, I should also mention the development of chemical rocket fuels. It has been announced that plants are being constructed in the US to produce boron compounds for this purpose. The boron hydrides which, with fluorine, fulfil the requirements of a rocket fuel, are thus gaining importance for reasons other than their enigmatic chemical structure.

Before leaving the field of inorganic chemistry, I ought to allude to the production of synthetic diamonds by General Electric in America. For strategic reasons the US Government has suppressed the details of the process as contained in the covering patent, but it is at least evident that very high pressures of over a million lb./sq. in. are probably used in conjunction with temperatures of the order of 3,000°C.

In other fields of chemistry, developments during 1957 have been mainly concerned with the continuation of long-term researches. One such research programme is the study of nucleotides which is proceeding at Cambridge under the direction of Sir Alexander Todd.

Also in the biochemical field, perhaps I may be forgiven for alluding to the progress which Dr. Brian and Mr. Grove and their colleagues have made during the last year within ICI. Theirs is one of the few British teams working on the plant growth-promoting substances gibberellic acid and related compounds. It now appears that there exists in plants a hormone balance such as is well known to occur in the animal kingdom.

Conclusion. These are a few items on the line of active development and it will be interesting to see how they progress during 1958. The list is far from being exhaustive but it is, I believe, enough to show that our science is very much alive and that it will continue to penetrate into the daily lives of our peoples.

I have not the least doubt that this wealth of exciting achievement in 1957 will enable us first of all to continue the task of extending the association's influence for the advancement of science throughout widening circles of British people.

I have very briefly sketched what to me is a wealth of exciting scientific achievement and thought, and I feel that, properly handled, such achievements can be made to compel the interest of the young people of Britain to the furtherance of the scientific ideal. To work for this end the council of our association is initiating two steps which will be integrated with each other and both should proceed simultaneously by methods which our secretarial organisation will in due course indicate. They will help to develop our inter-meeting activities. The two steps which are proposed are, first, area committees and then a panel of speakers. Area committees would seem to be essential for the whole country to make local arrangements for lectures, exhibitions and so on. The effectiveness of such activities will very largely depend on the effectiveness of the area committees.

The second piece of organisation is the formation of a panel of lecturers. We think such a panel must be large—more than a hundred—and its essential characteristic is that its members should be able to put across science to general audiences and to young people.

I have briefly indicated some of the matters that are much in mind as I take up the serious task you have assigned to me—to be your President for 1958. I trust that by diligence and interest and attention to business together we may make the year worthy to rank with any of its predecessors as one wherein the minds of British people will to an increasing degree respond to the opportunities given to them by the Advancement of Science.

Most of the developments mentioned by Sir Alexander were dealt with in the pages of CHEMICAL AGE *during* 1957.

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RECENT ADVANCES IN BASIC PHARMACEUTICAL RESEARCH

By W. H. Linnell, M.Sc., D.Sc., F.R.I.C.

MODERN PHARMACY is a composite subject and is based upon chemical and biological sciences. Contributions to progress, therefore, stem from many fields but all are connected with substances of importance in medicine. Therefore, developments in the pharmaceutical industries are best summarised under the various divisions natural to the subject.

Pharmaceutics deals with the preparation of the medicament in a suitable form for the patient's use—dispensing, formulation, etc.—and with pharmaceutical microbiology. Problems of formulation often involve abstruse problems in applied physical chemistry. In this respect work has been continued on the consistence of emulsions and the various factors concerned. The rheological behaviour of colloidal systems, particularly bentonite gels, has attracted attention as has the uses of this material in pharmaceutical preparations.

The release of medicaments from various types of ointment bases is being examined and it is interesting to note that the possibility of incorporating ion-exchange resins with adsorbed medicaments in ointments is being investigated.

Tabletting Studies

Fundamental studies concerning the various aspects of the process of tabletting have been initiated recently. These include granulation (in particular the formation of granules by capillary attraction); the transmission of forces through a compacting powder mass; the effect, type and concentration of binders on hardness made under conditions of constant pressure; and the factors affecting disintegration. Such studies will lead to a more scientific understanding of the process of making tablets.

In pharmaceutical microbiology the production of a poliomyelitis vaccine must take pride of place. Two firms are concerned with this work and it is expected that other firms may enter this field. It is probable that before very long an orally administered vaccine may evolve. Also in the imminological field a freeze-dried BCG vaccine has become available.

Prominence has been given in 1957 to the use of spectrographic analysis of bacterial cell material for identification and classification of bacteria. Data from spectrographic and chromatographic analysis together with biochemical tests could be combined in a computational analysis to evolve a more fundamental system for taxonomic studies in microbiology.

Several new antibiotics have been isolated and investigated but few will ever reach the production stage. Those

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Dean of the School of Pharmacy, University of London

recently released include cycloserine advocated for tuberculosis, and novobiocin with a penicillin-like spectrum. Synergism among antibiotics has led to the marketing of a combination of tetracyclin and oleandomycin, and the addition of sodium metabisulphite in formulae containing tetracyclin is said to give higher rate of adsorption when administered orally. Synthesis of phenoxymethylpenicillin has raised hopes of an economic synthesis of penicillin compounds.

Research in 1957 has shown that γ-irradiation as a method of sterilisation has several drawbacks. The amount necessary to ensure sterility is of the order of 2 M rads. at which level deterioration may occur. Enzymes appear to be comparatively unaffected but viruses are rendered non-virulent. Even comparatively stable chemical substances may be affected. Cat-gut, dressings and rubber gloves have been satisfactorily sterilised by this method.

Pharmaceutical chemistry, the chemistry of medicinal and pharmaceutical substances, has been concerned with the isolation, characterisation and synthesis of active substances from biological sources; with the synthesis of analogues and new drugs, and with the methods of standardisation of new products.

In the realm of tranquillisers, reserpine has been synthesised and an ingenious method of estimation has been based on the chloroform solubility of its compound with bromophenol blue followed by a colorimetric determination. Many new tranquillisers have been prepared such as pipradol (maratran, α-(2-piperidyl) benzhydrol hydrochloride) but recent work has emphasised the need for caution in assessing the value of such drugs. Only clinical trials with the human 'guinea pig' are of value. However, recent comprehensive clinical trials of meprobamate have established its value in certain anxiety neuroses.

In the analgesic field a new substance has been produced (R.875., +-2:2-diphenyl - 3 - methyl - 4 - morpholinobutyrylpyrrolidine) which is claimed to be the most powerful yet produced. From a consideration of the chemical and physical properties of analgesics some information has been obtained of the probable conformation of these compounds in solution. A hypothesis has been put forward which suggests that after adsorption on the 'receptor' site an oxidative dealkylation is a necessary step in the sequence of events leading to analgesia.

The structure of erythromycin has been determined and proved to be a 21-carbon lactone, erythronolide, linked to two unusual sugars, desosamine and cladinose. The antibiotics, methymycin and magnamycin have also been characterised.

Other Fields

Other fields of research which are being actively prosecuted include ameobiasis, helminthiasis, trypanosomiasis, leprosy, anti-thyroid compounds, blood coagulants and neuromuscular blocking agents.

The interest in steroids does not abate and research on fluorine-substituted steroids continues. A notable advance is claimed for 9-α-fluoro-6-methylprednisolone which is stated to have a glucocorticoid activity some fifty times that of prednisolone and nearly two hundred times that of hydrocortisone.

Steroids have been synthesised with a methyl group in the 6-α position, working on the thesis that steroids are inactivated *in vivo* by hydroxylation of this position.

Ion-exchange materials have attracted much attention for analysis, water purification and as carriers for medicaments. Compounds are formed by both acidic and basic drugs with appropriate ion-exchange resins which are slowly decomposed in contact with the ions of the gastro-intestinal tract thus releasing the drug which then exercises a sustained action. It is claimed that smaller doses of medicament will produce the desired effect owing to the maintenance of an effective concentration over an extended period of time. The incidence of unwanted side effects is thereby reduced.

Work has continued on the properties of phosphatide sols in relation to the formation of fatty-like films resembling simple cell membranes. Fundamental work of this character may lead to a greater knowledge of the absorption of drugs. The solubilising power of lysolecithin has been discussed by several authors.

The use of radioactive isotopes in medicine is coming to the fore and radioactive phosphorus and radioactive potassium iodide will shortly receive official recognition. This means that the dispensing of such products and their assay must receive a wider recognition and all pharmacists will have to be prepared to undertake such work.

The labelling of synthetic compounds

with radioactive traces is an important tool in the hands of both the chemist and the pharmacologist. Mention may be made of the use of ^{35}S in the preparation of biologically important amino acids containing sulphur. Physiological and pharmacological interest is shown in sulphur-labelled mustard gas, the sulpha drugs, pentothal, the suphones, phenothiazine, thiouracils and dextran sulphate.

Pharmacognosy. The last few years have been marked by a renewed interest in the plant kingdom as a source of drugs or of possible intermediates in the manufacture of new drugs, as for instance the use of steroids from sisal waste or from Elephant's Foot or from Mexican yams for the synthesis of cortisone. These developments have been largely occasioned by the development of chromatographic and counter-current techniques which now make it possible to 'take to pieces' a vegetable drug in a way that was almost impossible by the use of classical analytical techniques. By these modern means pure substances can be separated from the crude drug and their individual therapeutic usefulness assessed. Thus counter-current techniques enabled the clinically useful alkaloid, reserpine, to be separated from the remaining dozen or so alkaloids of the crude drug, which were almost inert. Similarly, protoveratrine has been separated from many undesirable alkaloids of *Veratrum* rhizome, khellin from *Ammi* fruits; d-tubocurarine from the arrow poison curare. These successes have led to an investigation of a number of old drugs and sometimes entirely new uses have resulted, e.g. the resin from *Podophyllum* rhizomes was formerly used as a cathartic but now has been shown to possess mitotic effects of possible use in cancer, and of established use in treating venereal warts. Among other crude drugs being investigated are liquorice (hormone-like action), hawthorn (cardiovascular action), periwinkle (hypotensive and coronary effect), camomile (anti-inflammatory effect). The flavanoid compounds from citrus fruits appear to have a vitamin-like activity and may play an important part in the prevention of diseases caused by impairment of the capillary walls.

Modern methods have also enabled certain vegetable drugs to be correctly evaluated, e.g. the anthraquinous purgative senna and its preparations were discarded by the USP because of variable potency. British workers have devised reliable methods of evaluation so that a stable standardised preparation of senna is now marketed by a British firm and is being manufactured in the US under licence. Similar methods of standardisation are being extended to other anthraquinone drugs, and to other crude drugs such as digitalis. The possible function of the active principles in the plant which produces them is also being studied; most of the work has been concerned with alkaloids. Some work, however, is being attempted on the role of the anthraquinone glycosides in the plant; it may well be that other glycosides will be studied since the recent discovery of indoleacetonitrile as a growth hormone in plants. Cyanide-containing glycosides, which could well give rise to the nitrile group of this hormone, occur in several crude drugs.

Pharmacology. The development which has exercised the pharmacological divisions of the larger firms during the last year has been the possibility of finding new tranquillising drugs for the treatment of psychoneurotic and psychotic conditions. A great difficulty has been experienced in finding appropriate animal tests for these substances, and it is generally agreed that the only final criterion is the effect on the patient.

The new ganglion blocking drug mecamylamine or inversine, of different chemical constitution from the methonium series, has been discovered.* It is generally agreed amongst clinicians that in hypersensitive cases it is more useful than any of the other ganglion blocking drugs. Its mode of action is still uncertain.

The production of vaccines for poliomyelitis and Asian 'flu, and the safety tests which should be associated with these materials, has been an important new development, and the expansion on this side has been much greater than any other during the last year. It appears not unlikely that this trend may go on in 1958, and it is possible that vaccines may be produced for other virus diseases.

Attention is continually directed towards research into the methods used for screening, and assessing the value, of new drugs. Species variation is an ever present problem.

* Merck Sharp and Dohme.

Sir Miles says 'Holler from Tree Tops'

(*Continued from page* 101)

thing in the way of corporate publicity.

A small number of companies attempt, each in its own way, to stress the importance of the industry to other industries and to the national economy. Now it will be necessary to stress our value also to the European economy, and the industry as a whole must consider this problem.

For us in Britain, the FTA will be a great challenge, but a challenge that I have no doubt we can meet successfully. We must be prepared to be more deliberately adventurous in our publicity. We must reassess all our techniques in the light of this great new challenge before us. We must cast aside all those practices which fail in that light; improve and adapt others, and continuously watch for any possible new methods.

Through vigorous, positive publicity, we can give a lead for more vigorous, positive selling.

The British chemical industry needs it badly. It must realise that no matter how good are its products it will not sell more unless it makes sure other people know of them. We must stop whispering down the well and holler from the tree-tops.

Instrument Makers Back F TA

(*Continued from page* 102)

THE Scientific Instrument Manufacturers' Association has a membership of around 160 firms. The oldest—a well-known optical firm—was formed in 1640, while the youngest joined the association a month ago. The products of the member firms range from the making of optical glass and lenses to nucleonic devices of great complexity. It will be appreciated therefore that the impact of the European free trade proposals on an association such as this was likely to produce a wide divergence of opinion.

For years, the optical and scientific instrument manufacturers have enjoyed protective tariffs and quotas and the experience of two wars has shown how wise it was to use every means to keep the industry flourishing by safeguarding the home market. On the other hand, the newer electronic and nucleonic firms have not enjoyed the same degree of protection and have therefore had to face problems of foreign competition on more equal lines.

It was perhaps surprising, therefore, that when a hurried referendum was taken among the manufacturers about a year ago at the urgent request of the FBI a substantial majority voted in principle for the free trade area proposals, provided the necessary safeguards were applied.

The matter has since been taken further because at the annual three-day convention of the association which was held in October of last year, a special panel debated the advantages and disadvantages of the FTA in great detail. It is only fair to say that one or two manufacturers expressed strong disapproval and saw in this plan the collapse of their particular section of the industry. Others however —and these were in the majority—were not only confident but looked upon this as a challenge.

A final referendum—taken at leisure this time—has confirmed the views of the association as expressed over a year ago, namely that a substantial majority is in favour of coming to terms with the common market and the industry is now gearing itself to try and increase its export figures which are currently running at just over 25 per cent of an annual turnover of around £60 million.

P. GOUDIME
President.

Scientific Instrument
Manufacturers' Association.

OUTLOOK FOR FARM CHEMICALS

Ample Scope for Further Expansion in UK Industry, says . . .

GREAT strides have been made during the past decade in the development of organic herbicides, insecticides and fungicides and today the use of chemicals for crop protection purposes forms an integral part of British agricultural practice.

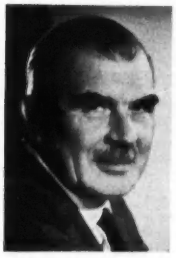
Apart from the impact of chemical developments on British agriculture the production of pesticides has now become a substantial and vigorous section of the chemical industry in this country, and with research proceeding actively and no lack of outstanding problems, there appear to be excellent prospects for further expansion in the future.

Seed-dressing machines are essential items of equipment for the corn and seed merchant who dresses his seed with appropriate fungicides and insecticides as a routine measure, and there are comparatively few arable farmers who do not possess a crop-spraying machine for annual treatment of their crops against weeds, insect pests, and fungus diseases.

Improved chemicals for crop protection have played an important part in increasing agricultural production during the post-war years, not only by direct reduction of competition from weeds and pests with the crop, but also by permitting a greater intensification of cropping and stock-carrying capacity of land.

Before discussing possible future trends and developments, a brief survey of the present range and applications of agricultural chemicals will indicate the extent of the progress which has been made in recent years, and also some of the important problems which remain wholly or partly unsolved.

. . . J. L. HUNT



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In the field of selective herbicides the introduction shortly after the war of the growth regulator weedkillers MCPA (2 - methyl - 4 - chlorophenoxyacetic acid) and 2,4-D (2,4-dichlorophenoxyacetic acid) in liquid form, coupled with the low volume crop-spraying machine, must take pride of place in agricultural chemical developments. These non-toxic translocated herbicides were quite unlike anything which had gone before, and with their low cost and easy handling properties they really put chemical spraying on the map. Even today MCPA is easily the most widely used selective herbicide, some 2,500,000 acres of cereals and grassland being treated annually in the UK.

As well as greatly extending the use of chemical weedkillers, MCPA has also largely replaced the contact weedkillers such as sulphuric acid and DNC (dinitro-o-cresol) which were used previously and possessed the disadvantages of corrosive or toxic properties. DNC has only been used in recent years for controlling annual weeds which are resistant to MCPA, and will become obsolete when non-toxic compounds with a sufficiently wide spectrum of weed control become available.

One such compound which has recently been developed is MCPP (2-(2-methyl-4-chlorophenoxy) propionic acid), which controls more weeds than MCPA, and would appear to have a most promising future. Another homologue of MCPA, which came into commercial production in 1956 is MCPB (4-(2-methyl-4-chlorophenoxy) butyric acid). The mode of action of this compound is particularly interesting, because it is inactive until converted by certain enzymes within the plant into MCPA. Its selectivity is governed by the presence or absence of the necessary enzymes in the crop or weed. MCPB is much more selective than MCPA to leguminous plants and therefore is valuable for weed control in newly-sown and established grassland and also with certain varieties of peas. It can be said that these propionic and butyric homologues act as valuable reinforcements to MCPA and have extended the range of applications of the growth regulator group of herbicides.

Dinoseb (2,4-dinitro-6-sec-butyl phenol) is another post-war development, which possesses the disadvantage of high mammalian toxicity, but has a wide field of use as a selective weedkiller in peas, beans, lucerne, clover and other leguminous crops.

The technique of pre-emergence weed control, whereby early germinating weeds are killed by application of a contact weedkiller before crop emergence, is finding increasing favour for sugar beet, vegetables and other crops for which a safe selective weedkiller is not yet available. Pentachlorophenol in oil emulsion is most commonly used for this application.

There is an acute demand for effective and safe selective weedkillers to control weed grasses, notably couch, wild oat, and black grass. Research workers in industry are actively engaged upon this problem and some useful progress has already been made. For instance, it is now possible to control couch grass in corn stubble and fallow land, and also appreciably reduce wild oat infestations by pre-sowing treatment in the spring. An extensive range of compounds feature in these applications, the most important being TCA (trichloroacetic acid), dalapon (dichloro-propionic acid), IPC (isopropyl carbanilate), chloro IPC, and several chloroacetamide compounds.

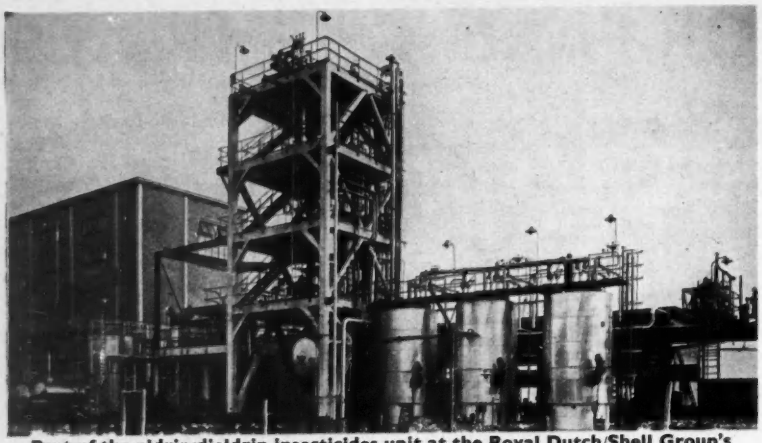
Before leaving the subject of weedkillers, mention should be made of two recent introductions in the sphere of total or non-selective weedkillers, which are becoming strong competitors of sodium chlorate. These are monuron (CMU) and simazin, both of which are characterised by long persistence and non-inflammability, and are thus likely to find extended use on industrial land, and on a more limited scale in agriculture.

In the field of insecticides, development of new toxicants and improved application techniques has been no less progressive. The natural and inorganic insecticides such as derris, nicotine and arsenic compounds which characterised pre-war pest control methods, have been almost entirely replaced by an impressive array of organic compounds, which fall into two main groups—the chlorinated hydrocarbons, and the organo-phosphorus compound. As with weedkillers the use of insecticides by the general farmer, as well as the fruit and hop-grower and the nurseryman, has increased considerably during the past ten years, and is still increasing.

Organic Insecticides

First of the organic insecticides to come into general use in the late 1940's were DDT and BHC (benzene hexachloride) and the fact that they are still widely used is clear proof of their high efficiency. They have been supplemented more recently by two other chlorinated hydrocarbons, aldrin and dieldrin, which have made impressive headway and found wide acceptance for a variety of applications, but mainly as soil insecticides. For this purpose, their stability, biological activity, and freedom from tainting and phytotoxic propensities are valuable attributes.

Chlorinated hydrocarbon insecticides will control a great variety of pests at low cost to the farmer, and low volume spray applications are suitable in most cases. These insecticides are, therefore, particularly popular with the farmer, who will only fall back upon the organophosphorus compounds, which are generally more expensive and often toxic, when the pest concerned cannot be



Part of the aldrin/dieldrin insecticides unit at the Royal Dutch/Shell Group's Rotterdam-Pernis refinery

adequately controlled by one of the chlorinated hydrocarbons. The use of organo-phosphorus insecticides is, in fact, confined mainly to control of aphids. Many of these compounds have systemic properties, the insecticides being absorbed into the plant and translocated to sites remote from the point of application. This imparts protective properties to new growth and also ensures control of aphids which may not be directly contacted by the spray. The two most widely used organo-phosphorus compounds are methyl demeton and schradan.

The increased usage of insecticides is also attributable to improved methods of application. The introduction of the cheap low volume spraying machine has been prominent in this respect, but the most outstanding development has been in the field of seed dressings. This cheap and convenient method of protecting crops in the vulnerable seedling stage against a variety of pests is now widely and successfully employed, BHC, dieldrin or aldrin being used, usually combined with a fungicide.

Another recent innovation has been to mix an insecticide such as aldrin with a compound fertiliser during manufacture, so that insecticide and fertiliser may be applied in one operation. Here again, a technique which reduces handling, storage and application costs has been welcomed by the farmer, both in this country and in many overseas areas.

Progress in the development of new fungicides has been less spectacular, but none the less substantial. The main feature in recent years has been a progressive replacement of inorganic sulphur and copper fungicides for use as foliage sprays with a variety of organic compounds, which are less damaging to foliage and therefore result in higher yields and better quality in the crop, while still providing efficient protection. Prominent amongst these are thiram (tetra methyl thiuramdisulphide), zineb (zinc ethylene bis-dithiocarbamate), ziram (zinc dimethyl dithio-carbamate), and captan (N-trichloro-methylmercapto-4-cyclohexene-1, 2-dicarboximide). For use as seed disinfectants there are no signs of any challenge to organo-mercury compounds from less toxic fungicides, but thiram and captan are now widely used for protection of germinating seeds against soil pathogens.

It is worthy of note that the majority of fungicides in common use are basically protective in their action although some also have eradicant effects. The possibilities of systemic fungicides have obvious attractions, not the least of which would be more efficient control of fungus diseases and reduction in the number of sprays which would be required to protect plants throughout the season. Investigations in the field of antibiotics show promise in this direction, but there appear to be no immediate prospects of this type of fungicide becoming available for any important applications.

The foregoing summary of post-war developments and current practice is sufficient to demonstrate the extensive progress which has been made in the agricultural chemical industry in a short period of time. What are the future prospects?

Considering these in general terms, it can be said that high productivity and cash returns per acre are an economic necessity in modern farming conditions. This objective cannot be attained if pests and diseases are allowed to decimate crops and weeds reduce their yields by competition for available nutrients. With the high costs of production which exist today and the limited supply of agricultural labour, it is no longer feasible to clean land by traditional cultural methods involving fallowing of land, and rotations with relatively few cash crops. Therefore, it can be confidently stated that chemical methods of crop protection cannot be dispensed with, and it is reasonable to forecast that they will be employed to an increasing extent in the future.

Apart from the probability of increased use of existing pesticides, there is great scope for further developments, in spite of past achievements, and it will be appropriate to conclude this review by discussing the principal outstanding problems, and making some tentative forecasts of future trends in the development of crop protection chemicals.

There are certain trends which are common to insecticides, fungicides and weedkillers alike. The first is a pronounced tendency for the number of different pesticides to increase year by year, so that alternatives are now available for the majority of applications. Secondly, there is a trend towards greater specificity, with products tending to become more selective in their performance. Thirdly, compounds which possess systemic action, the toxicant being translocated within the plant, are in the forefront of development; and finally, there is a pronounced movement towards the production of pesticides with low mammalian toxicity.

These are all trends in the right direction. When several different pesticides with different modes of action are available for a given application, the risk of resistant strains of weeds and insect pests developing is minimised.

Insecticides with specific action against a limited number of species are also valuable because they are less likely to destroy beneficial insects and pest predators. Low mammalian toxicity is most desirable, for besides the obvious advantage of reducing hazards to farm operators, livestock, and wild life, costs of developing the product are reduced considerably. The expense of producing the necessary toxicological and residue data before marketing a poisonous substance can be an extremely heavy item. The principal drawback of the trend towards more and more products each with a lower total potential usage, is, of course, an increase in over-all marketing expenses.

Future Trends

In conclusion, a general indication of the direction in which further expansion of the agricultural chemical industry may lie will be of interest. In the weedkiller field, selective herbicides are required for application to such crops as sugar beet, turnips, kale, vegetable crops and fruit. More effective and safe grass weedkillers which may be used selectively in growing crops are required, and there are certain important and specific problems, such as the chemical control of bracken. Virus diseases can only be attacked chemically at the moment by spraying against their insect vectors, and the production of chemicals which would be directly toxic to the virus may come to pass in the future.

Perhaps the most important problem of all concerns the various species of eelworm which attack cereals, peas, potatoes, sugar beet and numerous other crops. These insidious creatures, which are present in vast numbers in infested soils and are capable of remaining dormant for many years in the absence of a susceptible crop, take an enormous toll of crops, and no really effective control has yet been devised. Soil fumigants of various kinds do not function with maximum efficiency in the relatively cold and wet soils of this country, and it is probable that the answer will ultimately be found in some other form of chemical attack, possibly some form of systemic nematocide.

It will be clear from this brief survey that there is still ample scope for further expansion of the agricultural chemical industry, and present progress in technical developments suggests that it can look forward to the future with confidence and optimism.

ANNUAL REVIEW & 1958 PREVIEW

DEVELOPMENTS IN HIGH POLYMER CHEMISTRY

By M. S. WELLING

who from 1944 to 53 was engaged on research and development work in the high polymer field. He joined the publicity and information department of British Geon Ltd. in January, 1954

This survey outlines the most important advances which have taken place during 1957 in the field of high polymer chemistry. Several interesting new polymers were discovered, new and improved processes of manufacture were introduced and a number of new polymer plants came into operation.

AT a German plastics industry conference in April, Farbwerke Hoechst disclosed (1) a new process for making acetylene and ethylene directly from petroleum. The new method is aimed at boosting acetylene output by utilising crude oil in place of the costlier coal and electric power. According to Hoechst, large-scale production can begin fairly soon.

The Hoechst approach to petroleum cracking depends on a combination of pyrolyses. The first is the Hoechster Koker process for converting the high boiling fractions of petroleum into ethylene and propylene by hot coke cracking. The second—and probably the one with the best chances for commercial success—is a high-temperature conversion of light petroleum fractions, e.g. naphthas, petrol, and gas oils, with boiling points up to 200°C into acetylene and ethylene by pyrolysis in a methane/oxygen flame at 1,200°C. The third is a medium temperature (1,000°C) pyrolysis of the by-products ethane and propane from the first two cracking operations, to yield methane, hydrogen, ethylene and propylene. The second process is stated to be ready for production.

An interesting fact about the Hoechst process is (2) that instead of burning part of the feed itself to get the temperature needed for cracking, it burns a lean gas stream taken off at a point in the recovery process. The lean gas consists chiefly of hydrogen plus some methane. The gas, oxygen and naphtha feed are introduced into the flame.

Acetylene Yield

The gaseous mixture of acetylene, ethylene, carbon monoxide, etc., produced by this pyrolysis is cooled and aromatic by-products removed by distillation. Acetylene is removed by washing the mixture with a solvent, ethylene by low temperature distillation. Ethane and propane are channelled to a second cracking unit for pyrolysis at 1,000°C to produce methane, hydrogen, ethylene and propylene. The acetylene yield is 50 to 60 per cent and the additional yield of ethylene brings overall efficiency of the process to 90 per cent.

Knapsack-Griesheim AG, a subsidiary of Hoechst, were reported to be studying, (1) on a small scale, the cracking of low-boiling olefins to acetylene, utilising the recombination heat of hydrogen produced by a carbon electrode arc.

Another process for making acetylene from natural gas by an electric arc process was recently introduced by Chemische Werke Hüls (1). It converts methane into acetylene, hydrogen and hydrocarbons. The biggest drawback of this process is the tremendous electrical power required, with subsequent high cost.

The major impetus behind Germany's search for new ways of making acetylene is the one-sided fuel economy existing in that country: German industry relies on coal for 94 per cent of its raw materials and fuel requirements. Natural gas and oil supply the remaining 6 per cent, of which one-third goes into chemicals. German acetylene and ethylene production is based 88 per cent on coal and only 12 per cent on petroleum.

The Sachse partial oxidation process developed by BASF is one used by all large acetylene plants based on natural gas in the US today (3), e.g. American Cyanamid, Monsanto, Union Carbide, Rohm and Haas. It consists of partially oxidising natural gas by burning it in oxygen. Pure acetylene is recovered by selective absorption in a suitable solvent whence it is released by lowering the pressure. The acetylene produced is 99.1 per cent purity.

A modification of the Sachse process has been developed by Société Belge de l'Azote in Belgium (1) which is said to achieve higher efficiency. A semi-commercial unit producing 2 tons/day went up in 1953 in Brussels and a 20 tons/day plant is now being built in France (4).

Essentially the modification consists of improved burner design to achieve delayed introduction of hydrocarbons and a higher feed preheat. This minimises formation of undesirable carbon deposits. Whereas the Sachse process uses expensive solvents like dimethyl formamide or butyrolactone for acetylene absorption, SBA uses liquid ammonia which is far cheaper.

SBA have licensed Blaw-Knox and others to market this process in the US.

The process consists of the following stages: (4) The hydrocarbon feed (in gaseous or liquid form) is preheated. Separately preheated oxygen is mixed with the hot feed in the burner where it is partially oxidised. The reaction gases are quenched in a water spray and then pass through electrostatic precipitators to remove carbon particles. Carbon dioxide is removed by scrubbing with amine solutions or other absorbents. Aromatics, heavy acetylene homologues and moisture are removed in a scrubber. The cooled purified gas is then fed to the ammonia absorber where acetylene and polymers are absorbed at one atmosphere pressure. Hydrogen, carbon monoxide and ethylene pass on and are led through a water scrubber to remove trapped ammonia. Ethylene is recovered by liquefaction the residue containing mainly carbon monoxide and hydrogen, and being suitable for ammonia or methyl alcohol synthesis. The liquid ammonia, rich in acetylene, then flows to a stripper where acetylene distills off. The acetylene is passed through water to remove ammonia.

In Italy, Montecatini now use the Fauser partial oxidation process for producing acetylene (2). Here also the solvent used for acetylene absorption is a cheap one—methanol. The plant's capacity—20 tons/day is being increased by 100 per cent and another plant, designed by Union Carbide was reported to be under construction (2). This will be ready in the Spring of this year and will be integrated with butadiene/styrene rubber and nitrogen fertiliser plants.

Some laboratory scale processes have also been reported; in Great Britain the National Research Development Corp. has obtained US and British patents on two partial oxidation processes (2). In one, methane and oxygen are burned in a fuel-rich mixture in an internal combustion piston engine.

Knapsack-Griesheim have carried out experiments using an electric arc to convert molecular hydrogen into atomic hydrogen which is very active and brings about a number of reactions with hydrocarbons.

The oxythermal process of making

High Polymer Chemistry

calcium carbide which was developed by BASF in 1956 has made further advances and BASF have stated (1) that they plan to supplement their present 70 tons/day pilot plant with a 250 tons/day commercial production furnace. Whereas in the usual method for making carbide, limestone and coke are fused by an electrothermal process, in the BASF oxythermal process (5) the energy required for the reaction between limestone and coke is supplied by combustion of coke in an atmosphere of oxygen-enriched air. The product gas is almost pure carbon monoxide. The reaction is carried out in conditions resembling those in a blast furnace such that the incoming coke and limestone are preheated by the hot carbon monoxide.

The preparation of butadiene by cracking of cyclohexane was reported by Costexcu and Szekely (6), using an electrically heated incandescent wire. Butadiene and ethylene are separated by adsorption on active carbon. The butadiene obtained is 88 per cent pure.

New Polymers: Perhaps the most significant progress in the field of polymers during 1957 was the development of polypropylene, the polycarbonates and polyoxymethylene.

Investigating a series of special catalysts, Professor G. Natta of the Milan Polytechnic discovered (7) that in the polymerisation of some olefinic hydrocarbons, these catalysts promote the formation of stereoisomeric structures. These catalysts have been called stereospecific, and the resulting polymers isotactic polymers.

Polypropylene

Polypropylene was among the first products of this series to be investigated in order to establish industrial production methods. Industrial quantities of polypropylene have already been marketed (7) by Montecatini under the trade name Moplen of which there are two grades—Moplen 1, a lower molecular weight polymer, very fluid in the molten state and therefore suitable for extrusion of films and blow moulding of containers, and Moplen 2 which has a higher molecular weight and can be easily extruded or injection moulded.

In the US the Hercules Powder Co. have also announced (8) the development of polypropylene which will soon be in full production, annual capacity being in the region of 10,000 tons. The product will be known as Pro-fax. The plant is said to be the world's largest commercial plant to produce polypropylene and the first plant in N. America to produce this material on a commercial scale.

The most interesting feature of these new materials (9) is their thermal resistance; they resist temperatures well above 100°C so that they can be sterilised. Dimensional stability is retained at 150°C and other useful properties include shock resistance, toughness and excellent resistance to chemical attack. It is thought that the characteristics of polypropylene will permit its use in fields where other plastics materials cannot at present be utilised, e.g. for piping and conduits for hot liquids and gases. Other potential uses include packaging, chemical plant and domestic ware.

Advances have also been made in the development of polycarbonates. The first announcement of a group of new thermoplastic materials was made late in 1956 (10) by Farbenfabriken Bayer. It summarised work that had been carried out between 1953 and 1956 in the Bayer Research Laboratories. Physical and chemical tests applied to them revealed a number of valuable properties which could well open up extensive applications for these compounds.

The fundamental possibilities of producing esters and polyesters of carbonic acid had been known at the start of Bayer's researches, but there had been no useful process for producing high molecular weight products. Industrially useful processes for manufacturing such compounds had therefore to be developed and the following four types of process were found to be possible (10).

1. Ester interchanges of dihydroxy compounds with diesters of carbonic acid obtained from monofunctional aromatic or aliphatic hydroxy compounds.
2. Ester interchange of a bis-alkyl or bis-aryl carbonate of a dihydroxy compound with itself or with other dihydroxy compounds.
3. Reacting dihydroxy compounds with phosgene in presence of acid binding agents.
4. Reacting bis-chlorocarbonic esters of dihydroxy compounds with dihydroxy compounds in presence of acid binding agents.

30 Polycarbonates

It was stated (10) that Bayer had made at least 30 different polycarbonates from 4:4′-dihydroxydiphenylalkanes. According to Bayer nearly all the polycarbonates prepared from 4:4′ dihydroxydiphenylalkanes are soluble in methylene chloride, a number of them also in aromatic hydrocarbons, esters and ketones. In the absence of steam and alkali or acid impurities they are stable in the molten state for long periods up to more than 300°C. These properties offer the possibility of manipulating the resins by solution techniques or by thermoplastic shaping. Fibres, films or varnish coatings can be prepared by conventional methods, and above the melting point fibres, films, blown foils, blown objects, etc., can be easily produced. They have no definite melting point but pass from solid to fluid state within a fusion range.

Great interest in these materials was stimulated in the US and in April 1957 (11) General Electric announced the outcome of their research in the field of polycarbonates; this was the development of Lexan, a polycarbonate whose heat distortion was claimed to be less than that of nylon and polystyrene. No other details were disclosed about their approach to polycarbonate preparation but it was believed to cover the same broad areas as Bayer's.

A month later came another announcement, this time by Eastman Kodak (12) to the effect that they had been granted a series of patents on polycarbonates (13). The Eastman Kodak series of polycarbonates were not specifically those made by Bayer or General Electric but chemically they were similar. The principal difference appeared to be that Eastman Kodak were concentrating on crystalline polymers, presumably to try to find a film- or fibre-forming polymer.

The Eastman process differs from those described to date in several respects (14). It uses titanium-containing catalysts, e.g. 1,4-dioxane complex of titanium tetrachloride with self-condensing bis(carbonate) monomers to form highly polymeric linear polycarbonates. By using p-xylylene glycol bis(ethyl carbonate) and titanium butoxide, for example, a white crystalline product of melting point 239°C was obtained. The polymers prepared by Bayer had a melting point of about 270°C and were less crystalline.

Butadiene Elastomers

In June Professor Natta gave a lecture (15) dealing for the first time with a group of elastomers based on butadiene which had been in the course of development during the past three to four years. Research has been carried out on two main lines: (i) The production of particular stereoisomers of polydiolefins having definite steric configurations. (ii) The production of elastomers from linear olefin polymers and copolymers having very high molecular weight and improved resilience. Investigation of new polymerisation processes led to the discovery of different catalytic systems, which enabled Natta to synthesise many different stereoisomers of linear crystalline polybutadiene as well.

A new polymer with potentials as a plastics material was described by C. C. Price at a symposium in Rochester, US (16). Price first made isotactic polymers from propylene oxide in 1953 and these appear promising as fibres or plastics. They have a good crystalline structure and molecular weight as high as 500,000, while the softer atactic polymers look hopeful for the production of improved foam rubbers.

Dow have been granted patents (17) for a catalyst said to be an iron-alcoholate complex. According to Price, alkoxides of Lewis-acid metals were found to be useful too for this type of polymerisation. Aluminium isopropoxide is most effective, particularly where combined with zinc chloride. Homogeneous liquid catalysis either in the straight monomer or diluted in diethyl ether at 80°C was said to give the best yields of isotactic polymers; lower temperatures result in slower polymerisation while higher temperatures produce a lower yield of isotactic material.

Optically active monomer produces an optically active polypropylene oxide. This has helped in the investigation of the polymerisation process which is regarded as being a co-ordination mechanism similar to that giving isotactic polyolefins

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by the Ziegler-Natta catalysis in which Lewis-acid metals—under similar conditions—form a carbon-to-metal bond. It was stated that further work on isotactic and atactic polypropylene oxide was planned and that the latter would probably be more useful for synthetic rubber production than the olefins themselves.

A polymer said to have great potentialities also made headlines in the US (18). This is the material Delrin, which is an acetal resin developed by Du Pont and derived from formaldehyde. This is an interesting development insofar as this is the first time that it has been possible to polymerise formaldehyde to produce a plastics material. Du Pont claim that Delrin is less affected by temperature in strength, stiffness and toughness than any other commercial thermoplastic. It is thought that Du Pont will be ready to start commercial production of Delrin about 1959. Pilot quantities for extrusion and injection moulding are available already.

New Elastomer Family

News of an entirely new family of elastomers developed by Goodyear was also released (19). These speciality rubbers are derived from the reaction of the double bonds of conventionally prepared diene rubbers with low molecular weight alkyl mercaptans. The reaction is in effect free radical addition of the mercaptans to the double bond of the diene.

By varying the nature of the base polymer, the mercaptan used, and the extent of saturation, a wide range of compositions, and of physical properties, was attained.

In general, resistance to ageing, ozone attack, heat, solvent swelling and to permeation by gases increases with increasing extent of saturation.

The reaction is usually carried out in latex form and the general technology and equipment used in making GR-S and like polymers lend themselves well to their preparation.

The technology of using adduct elastomers (20)—processing, compounding techniques, curing recipes, fabrication methods, etc., follows closely the methods used for the standard diene rubbers.

Ethylene Oxide Polymers

In November (21) Union Carbide Chemicals announced a new family of water-soluble resins whose potential uses were said to be in the adhesives and cosmetics field as well as for the warp-sizing of yarns. These resins whose trade name is Polyox are polymers of ethylene oxide whose outstanding feature is said to be unusual thickening power at low concentrations in aqueous solutions. They resist biological attack, oils and greases and are compatible with other polymers such as polyvinyl alcohol. They have exceedingly high molecular weights, ranging from 100,000 to several million.

A copolymer of butadiene and α-methyl-β'-vinyl pyridine, first developed some 20 years ago, was stated (22) to be available soon in pilot plant quantities from Hüls. It will be sold under the trade name Bunatex Vp and be specifically used in the impregnation of textile goods to improve their adhesion to rubber, e.g. in the manufacture of tyres.

In December (23) it was announced that experimental tests are being carried out on a new range of plastics based on sucrose, formaldehyde and phenol. Suggested uses include glass fibre laminates having flexural strength of up to 57,000 lb/sq. in. Others, it is said, can be combined with styrene and vinyl acetate. It is understood that these plastics materials were developed in the US.

In the field of fluorine polymers the increasing importance of p.t.f.e. was demonstrated by the report (24) that Du Pont and Union Carbide Corporation were planning to manufacture 1,200 tons and 200 tons of this polymer respectively during 1958.

Polythene: An article in April (25) described recent advances which have raised the possibility of greatly improving the low temperature properties of polythene in tape, film or moulded form. This can be achieved in two ways. The first method employs catalytic methods of producing the polymer which results in a more linear molecule; the second method consists of automatically irradiating the material, a process which resembles the vulcanisation of rubber. The effect is one of cross-linking and while this process has been successfully applied to the ordinary high-pressure polythene, it is now known that rigid or low-pressure polythene reacts similarly.

Whereas unirradiated polythene flows above its melting point, the irradiated material is converted to a rubber-like material above the usual melting point and recovers its initial shape if cooled without stress. Among advantages of irradiation treatment are reduction in cold flow, absence of crazing, and improved elastic response.

The big names for 1958 would appear to be the polycarbonates and polypropylene—the latter made from a gas which had previously defied all efforts at polymerisation. Synthetic rubbers too will play an increasingly important part in British industry and low-pressure polythene, though it may not yet become the leading British plastics material, will very likely come a close second after p.v.c.

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More than 250 Firms will show at Chemical Engineering Exhibition

ONE of the outstanding events of 1958 in the chemical engineering world will be the Chemical and Petroleum Engineering Exhibition to be held at Olympia from 18 to 28 June. It will be the first exhibition staged in this country devoted not only to chemical plant but to oil-getting and refining equipment. The exhibition will be sponsored jointly by the British Chemical Plant Manufacturers Association and the Council of British Manufacturers of Petroleum Equipment.

Exhibitors to date total over 250 firms whose stands will cover an area of over 125,000 sq. ft. and occupy the grand and national halls at Olympia. Among exhibitors will be CHEMICAL AGE.

There have been many outstanding post-war developments in Britain but it is doubtful if any surpass the growth of the chemical and the oil refining industries and the way in which they have combined in the production of petrochemicals and materials derived from them, such as the new plastics and detergents.

At this exhibition the British chemical plant and petroleum equipment industries will demonstrate the part which they have played and are continuing to play in the amazing development of the industries they serve at home and overseas. It is anticipated that visitors from all over the world will be at Olympia at this time; in fact, there should be the largest gathering ever seen in this country of those concerned with chemical engineering.

During the exhibition the Institution of Chemical Engineers and the Institute of Petroleum will stage a joint symposium on 'The organisation of chemical engineering projects'. This symposium will also be a meeting of the European Federation of Chemical Engineering and papers will be presented at four sessions spread over three days. There will also be film shows to demonstrate the contribution made by British firms to the growth of chemical and petroleum engineering.

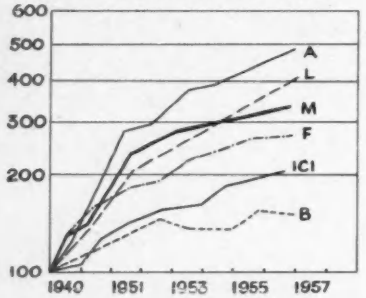
Organisers of the exhibition are F. W. Bridges and Sons Ltd., Grand Buildings, Trafalgar Square, London WC2, from whom full particulars may be obtained by prospective exhibitors and by those who wish to visit the exhibition.

ASSETS AND PROFITS GROWTH OF SIX UK CHEMICAL GIANTS

IN this survey of chemical companies, a comparison between six of the giants is given and a comparison of dividends over the last two years with a selection of other companies in the fine and heavy chemical and plastics sections. Finally the business outlook for 1958 will be considered.

The six equities must be familiar to all—Laporte, ICI, Fisons, Monsanto, Albright and Wilson, and Brotherton. The two charts are intended to show growth of total assets along with the net trading profit. Taking the first chart showing the growth in total assets it is as well to remember that it gives a precise comparison in terms of

GRAPH 1
Growth of Total Assets: 1948=100



percentage growth and not the absolute values involved. ICI, of course, are overwhelmingly the largest unit in terms of actual assets, accounting for £535.7 million of the aggregate at the last balance sheet comparison—adjustment was also made in the ICI figure for the assets revaluation of 1950.

It will be noted that ICI have been outstripped in the relative pace of growth by smaller units, with Albright and Laporte well to the fore.

Turning to the net trading profit chart which is the yardstick of actual trading experience the Korean War curve in 1950–52 should be noted. The steep advance and the plunge to near the base-line for some is also noteworthy. Laporte are found to be well in the lead again, ICI and Fisons have a steadier if rather less spectacular record, but while Monsanto hold third place above ICI, their record is erratic and they have not maintained the lead they took in 1951. Albright have not kept pace with growth in trading assets.

In comparing the records, it was found that Brotherton's would not rank in the list of growth stocks. The chairman has virtually forecast a lower final payment and for this reason he outlook must be uncertain. Albright and Wilson's peak pace of growth in assets has not been accompanied by a commensurate growth in profits. A declining trend has also been noted for Monsanto Chemicals. Fisons' record is a steady one with an improving profits/assets ratio and with an encouraging profit growth.

In each phase the ICI group has shown excellent results, and all the evidence suggests that the management is of the highest order. Obviously, there is nothing top-heavy about management here, despite the remarkable size and scope of the organisation.

Laporte which, on the graph holds pride of place, plays a leading role in both cases, and it looks a good second to ICI for the

By our Financial Correspondent

growth investor. There are some snags, of course, in such an approach. These trends, as the records themselves show, are not irreversible.

Monsanto and Albright are both sturdy units and will both probably show a different pattern five years hence. The former has powerful US associations which though

DIVIDENDS

	1956	1957
Heavy Chemicals	%	%
Borax (Holdings)	23	25
Bt. Glues and Chemicals	15.3	18.5
Bt. Oxygen	10.0	10
Coalite and Chemicals	12.0	12.5
Hickson and Welch	15.0	15.0
Lawes Chemicals	12.5	12.5
Fine Chemicals		
Evans Medical	10.8	10.8
Gas Purification	*40.0	*40.0
Glaxo Laboratories	14.0	12.5
Howards and Sons	2.5	4.0
Yardley and Co.	52.5	†31.5
Plastics		
Distillers	17.5	18.75
B2 Plastics	20	20

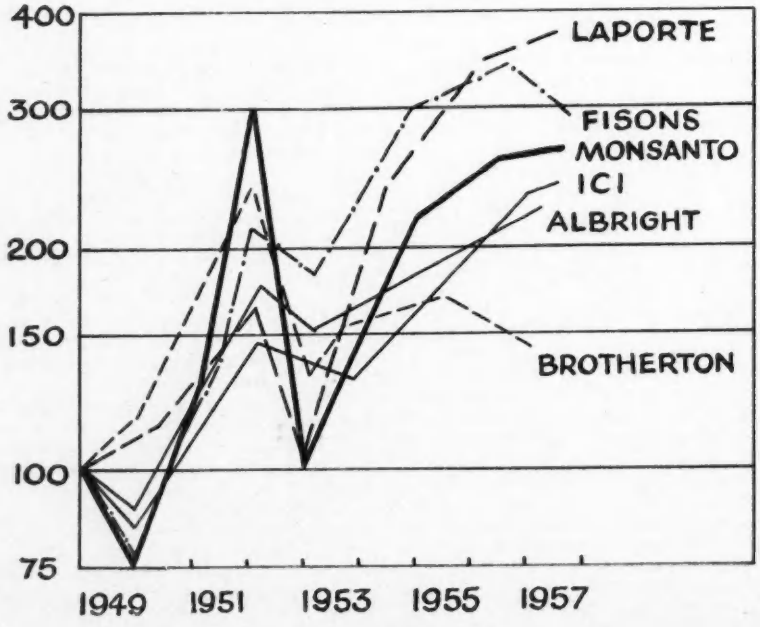
*Equiv. bonus: capitalisation. † After bonus.

up to now have proved disappointing may well be a valuable contribution in a few years' time.

Albright have had a fair amount of teething troubles, but may well gain ground when the Marchon acquisition is developed.

The chemical industry's prospects for this coming year are, as always, expected to remain in the lead of our industrial field. Other factors outside their jurisdiction will come to bear, such as the bank rate and the continuation of the credit squeeze. Generally it is not expected that there can be more in the coming year than stolid markets. Perhaps from September onwards as the business climate improves one or two bright spots might well occur.

GRAPH 2
Growth of Net Trading Profits



Work Begins on Crosfield Extension

THE FIRST pile of the new chemical building to be built by Joseph Crosfield and Sons Ltd., at Warrington, Lancs, was driven recently. This building of five storeys and costing £1 million is the first new construction in the eight-year rebuilding programme reported in CHEMICAL AGE, of 10 and 17 November, 1956, pp. 249 and 289. It should be completed in 1960.

In it will be concentrated most of the Crosfield chemical production which is at present being carried out over a large area of the 37-acre factory.

It is the company's intention eventually to concentrate production on the Lancashire side of the Mersey.

Sharples Confident About Future

Optimism regarding the company's future prosperity was expressed at the recently held 1957 sales conference of Sharples Centrifuges Ltd., both by Mr. G. P. Balfour, managing director, and Mr. M. E. O'Keeffe Trowbridge, technical director. Overseas representatives who specially travelled to the UK for the occasion, were also confident about prospects in their countries.

Reticular Aluminium-Tin New Type Bearing Alloy

PRODUCTION of a new type of bearing alloy is announced jointly by the Tin Research Institute and the Glacier Metal Co., who have been working together for some years on its practical development. The new bearing alloy contains about 20 per cent of tin, the remainder being aluminium hardened with from 1 per cent to 3 per cent of copper. The tin constituent has a structure which is reticular within the continuous aluminium matrix. Should metal to metal contact occur between a shaft and a bearing with this reticular structure there is an immediate supply of tin available at the surface to provide a thin soft layer of tin over the aluminium and thus inhibit surface breakdown. Therefore, strength of a continuous aluminium phase is combined with the tin-availability of a comparatively heavy and continuous tin structure.

The TRI state that when supplied in the form of steel-backed bearings, it provides a better balance between the opposing demands of high fatigue strength and low rates of wear than any other known plain bearing. No lead-based overlay plating to keep shaft wear in check is required and since the alloy contains no free copper there is no danger of copper penetration of steel journals in diesel engine applications.

Bearings of the alloy have already proved themselves in extensive road and test bed trials carried out over the past three years, and some half million are already in actual use. Compared with copper-lead plates types, steel-backed reticular aluminium-tin bearings are inherently somewhat cheaper to manufacture.

BCPMA 1957 Directory Now Available

THE latest (1957) edition of 'British Chemical Plant' contains the names and addresses of the 222 members of the British Chemical Plant Manufacturers' Association together with advertisements from 126 of these members. There are 1,347 headings and sub-headings in the classified index which is printed in English with French, German and Spanish translations of the subject headings.

Six thousand copies have been printed (compared with five thousand in 1955, the previous edition) for distribution to chemical and allied manufacturers in the UK and abroad. A limited number of copies is being held in the association's office at 14 Suffolk Street, London SW1, and they will be supplied free of charge to chemical plant users on application.

Crosfields Open New Training Centre

A NEW training centre was recently opened at the Warrington, Lancs, works of Joseph Crosfield and Sons Ltd. It will provide a centre for all phases of employee training from first apprenticeships, through routine refresher courses, to leadership and promotion classes.

The building is constructed with suspended ceilings giving good thermal insulation and acoustic properties. Heating is by electric heating cables embedded in a concrete floor 'floating' on glass fibre insulation.

Criteria for Acceptance of Antibiotics as Food Additives

Reply to London Conference Question

AT the recent conference on Chemical Additives in Foods held at the Royal Institution, London, a question was directed by Dr. M. Ingram to Drs. C. A. Morrell and F. S. Thatcher, the authors of the paper 'Antibiotics in foods' (and of this present note) (CHEMICAL AGE, 10 August, p. 209). The authors were unable to attend the conference, but express their thanks to Mr. Charles Adams who accepted the unenviable task of reading their paper for them.

Dr. Ingram's question concerned criteria listed for acceptance of an antibiotic as a food preservative, and specifically, 'The fifth of these criteria, if I have it rightly, was that the antibiotic should induce no abnormal spoilage pattern'. Dr. Ingram continued to illustrate that any effective amount of antibiotic must inevitably modify the spoilage flora in treated foods. This had been shown by the development of numerically dominant populations of yeasts in foods treated with tetracyclines.

The statement referred to by Dr. Ingram occurred in a list of conclusions and was expressed as follows: 'Any permitted use in or on foods should be subject to repeal in the event that (a) their microbial selectivity gives rise to new or abnormal forms of spoilage or disease or (b) evidence for a significant increase in the prevalence of antibiotic-resistant pathogens as a result of their use in foods becomes apparent'.

Dr. Thatcher in a note to CHEMICAL AGE received last week states that the general observation is made in the text of the paper, '. . . whenever the normal micro-ecology of a mixed population is disturbed by any selective process, the risk arises that specific populations or species normally held in check by competitive microbial action may become dominant and, on occasion, may give rise to new forms of spoilage not normally encountered'. A number of illustrations were then given, including reference to those 'where antibiotics are the equilibrium-disturbing factor', and with appreciation of the potential effects of both 'natural' selectivity and that resulting from induced resistance to a given antibiotic. 'We would expect', says Dr. Thatcher, 'that when an antibiotic-treated food does eventually spoil, its component flora would differ from its untreated counterpart.

'Thus, the response to Dr. Ingram's question would have been agreement with the principle that he expressed, and by way of further clarification of the statement in question we would add that another way of expressing its intent would be: (1) There will be no value in the use of antibiotics if one spoilage pattern is simply replaced by another during the expected shelf-life of the treated food; (2) if pathogenic organisms multiply more rapidly in the absence of some of the usual flora and their numbers increase to significant levels; or if antibiotic-resistant pathogens occur with significantly greater frequency as a result of treatment then we would have every reason to become concerned.

'Present evidence fails to establish a health hazard, and the shelf-life of poultry and fish continues to be extended by treatment with the permitted antibiotics. However, Canada has the necessary legislative machinery for prompt amendment of the pertinent regulation under the Food and Drugs Act if positive evidence should point to the likelihood that significant hazards may materialise.

'As we also pointed out in our paper, "Final conclusions on specific aspects . . . can only be determined after appropriate experience". Until such time, some measure of subjective decision cannot be avoided.'

New Inorganic Pigment Plant Will Give 400 per cent Output Increase

AN 8,000 sq. ft. extension to the Ferro Enamels Ltd. factory at Wombourn, Wolverhampton, is now nearing completion, and will house one of the most up-to-date colour oxide plants in Europe. Total cost of new plant and equipment is £75,000.

New flow production methods used in the plant, coupled with the latest type of processing equipment suitably located for efficient layout, are expected to increase output by 400 per cent. Furnaces to be installed have been designed and constructed by Ferro's own engineers and will have the highest degree of accuracy in the calcining operation ensuring the uniformity of each batch of materials processed. This is said to be a vital factor when temperatures in the order of 1,300°C are being controlled and particularly when repeat orders for individual colours must be exact matches.

To ensure that the final colours are 100 per cent free from unwanted salts, no matter which shade of the one thousand and one introduced, special filter machines are being installed. As a result any such contamination will be removed while the colour is still in the liquid state, and before drying and final processing. At this stage of the process the colour consists of minute particles of solids floating in a liquid which has eventually to be separated from the solids. This is achieved by passing the colour through a vacuum system incorporated in the machine.

This type of filter will reduce processing time and save fuel in the succeeding drying operation as the colour will leave the filter with a high percentage of the moisture removed. At one stage the product is brought from a solid to a liquid state to ensure the highest standard of manufacture, and is then retained in the liquid state to enable it to be pumped to a higher level so that the minimum time is spent in the transfer operation to the next machine.

A NOVEL suggestion deserving consideration is that made recently by Mr. S. Goodman, president of the Transvaal Chemical Manufacturers' Association, as an effort to induce chemistry lecturers to stay at their posts. He wants the South African chemical industry to tax itself voluntarily to provide funds that could be used to supplement the salaries paid to teachers or lecturers of chemistry.

He is alarmed at an apparent decrease in the number of scientific students and feels that the pace of industry, particularly in the chemical sector, might be slowed down because of a shortage of suitably qualified people. Educational institutions could not pay more to keep their teaching staffs, hence his suggestion that the chemical industry should levy itself to make good the shortfall.

No one would argue with his conclusion that the population of student chemists cannot increase until there are more teachers. But so far as this country is concerned, chemical manufacturers would probably feel that while the idea is attractive, the Treasury ought first to give a lead by increasing university grants.

THE FIRST charge of nitroglycerine to be made at Ardeer was produced almost 85 years ago in January 1873 at the new factory of the British Dynamite Company. This 1,500 lb. of nitroglycerine was the first batch to be made in the UK and marked the foundation of an industry whose products found ready employment at a time of great industrial expansion.

Methods of production, perfected by Alfred Nobel, are a far cry from the modern remote-controlled plant which came into full operation towards the end of 1957.

TWO FACTORS combine to undersell the achievements of British industry. First the false modesty of too many industrial concerns and second the preoccupation of most popular newspapers with sex, crime and disaster. It is news when a train crashes or when a strike infrequently disrupts the industrial scene, or when a vast contract is lost to a UK company. The fact that British Railways have one of the best safety records in the world, that Britain enjoys a greater measure of industrial peace than most other countries and that British industry gains worthwhile contracts week in and week out is not news.

British achievements in industry, science, culture and art are outstanding. That is why *'Speaking for Britain'* has arrived on the scene at a particularly welcome time. A new monthly journal for those 'who have the interests of Britain and the Commonwealth at heart', it is the first practical result of the recently formed Operation Britain Organisation Ltd.

One of the most interesting features is an article by Mr. Victor Feather, TUC assistant secretary, who puts a proper perspective on UK labour—management relations.

Among industrial success stories to be featured is that of Terylene. This was an obvious choice, but most chemical firms could doubtless relate notable achievements, even if not on such a vast scale. The gaining of large contracts, the introduction of new chemicals, the development of new processes and the discovery of new techniques in industrial laboratories are continuing processes. But because of a false modesty or because the busy executive often fails to appreciate their news value, such developments often go unsung.

I should be delighted to hear of them and to see that they receive the publicity they deserve.

A NEW automatic camera microscope, the first to reach this country, was delivered at the year-end to Standard Telecommunication Laboratories Ltd., Dowlish Ford Mills, Ilminster, Somerset. There are less than 12 of these £1,000 instruments in the world and a duty free import licence, valued at several hundred pounds, was granted by the Government in view of its importance and the fact that it is not made in the UK.

Mr. A. H. Degenhardt, managing director of the UK agency for the non-profit making Carl Zeiss Foundation of West Germany, says the camera has a fully automatic exposure-adjusting mechanism It is suitable for visual observations as well as industrial photomicrophy and for microprojection. Exposure mechanism is pushbutton operated, the instrument adjusting its exposure time automatically to correct value depending on intensity of light.

THERE have in the past 12 months been some complaints at the ABCM statement that the chemical industry favoured the European free trade proposals, because this approval was assessed on manpower in terms of capital employed, without saying how many firms actually voted for or against the scheme.

The feeling of these complainants is that the method of assessing opinions on the FTA must load the vote in favour of the bigger companies who are known to welcome the freeing of trade at the expense of smaller companies, who are obviously not so well disposed to adapt themselves to greater competition.

The results of our questionnaire, analysed in page 87, show that the majority of companies returning it favour the project. As this survey went to all companies and asked for a straight 'Yes' or 'No' answer, it discloses that many smaller firms are prepared to accept the challenge of free trade. It is interesting to pick out of the many comments, one made by a fine chemical producer. He anticipates a reduction in the number of lines made by the company, but increased sales for lines still retained after the start of an FTA.

A VIGOROUS campaign to prevent planning permission being continued for a rubber laboratory of the Factice Research and Development Association in Brook Road, Fallowfield, Manchester, is being led by Miss Rona Robinson, a 71-year-old retired industrial chemist. Miss Robinson claims that fumes from the laboratory are 'practically a death sentence for older residents'.

Chief research chemist, Mr. F. A. C. Featherstone, told a local newspaper that the laboratory was 'working on the hundred grammes scale' and was not pumping anything into the air as a manufacturing plant might. A spokesman for the Manchester Health Department said that frequent inspection of the premises had failed to disclose any emission of harmful fumes.

In 1947 the association was granted a permit covering a ten-year period, allowing the laboratory to be used for research in connection with rubber and vulcanised oils. The conditions prohibited the emission of fumes or the creation of other nuisances.

THOSE of my readers with a passion, like me, for trains (steam) will be gladdened by the news that Mr. Peter C. Allen, ex-chairman of the ICI plastics division and now on the company's main board, has just published a third book—'On the Old Lines' (Cleaver-Hume, 25s).

Educated at Harrow and Trinity College, Oxford, Peter Allen has been fascinated by trains since his boyhood. The far-flung interests of the ICI organisation now take him to all corners of the world and between business he always contrives to note and photograph the steam locomotive in its many forms and in many remote places.

His latest book is to a great extent a picture-book, with photographs on every right-hand page and informal talks and reminiscence on every left. The section dealing with Spain is particularly rich and many endearingly antiquated engines still survive.

With a flair for conveying the atmosphere of the railway itself as well as the character of his well-loved locomotives, Mr. Allen brightens his book with gems of information such as the one on the West Australian locomotive with a thirst equivalent to 17,000 sheep, and why Peruvian peasants wear trilby hats.

Alembic

PROGRAMME OF FERTILISER PRODUCTION IN INDIA

Large-Scale Increase Planned

PRODUCTION of nitrogenous fertilisers in India has increased ten-fold since 1951 but the country still imports about 200,000 tons of fertilisers every year. The present installed capacity for the production of nitrogen is only 86,000 tons as follows: Sindri Fertilisers and Chemicals, 70,000 tons; Fertilisers and Chemicals (Travancore) Ltd., 9,000 tons; Mysore Chemicals and Fertilisers, 1,000 tons; by-product ammonia 6,000 tons.

To meet the increasing demand for such fertilisers, it is proposed to set up additional capacity of 282,000 tons during the second plan period (Table 1) so that it will be possible to produce about 370,000 tons of nitrogen a year. It has been estimated by the Ministry of Food and Agriculture that the demand in 1965–66 would be of the order of 870,000 tons of nitrogen. In order to meet this demand effectively from indigenous sources, installed capacity of the order of 1,000,000 tons is necessary.

The possibility of augmenting production of ammonium sulphate, based either on sulphuric acid derived from sulphur, or on gypsum is extremely limited. There are no known deposits of sulphur in the country. Although there are reserves of about 80,000,000 tons of different grades of gypsum in Jodhpur, Bikaner and Saurashtra, Sindri alone requires about 750,000 tons of gypsum of 87 per cent purity every year. An additional 350,000 tons per year are required for cement. It is therefore necessary to augment the production of other nitrogenous fertilisers such as nitrolimestone, double salt of ammonium sulphate and ammonium nitrate, urea ammonium phosphate, etc.

Phosphatic Fertilisers. India's cement requirements of P_2O_5 are estimated at about 170,000 tons (when used in admixture with 50 per cent of nitrogen). This is expected to reach a figure of 1,740,000 tons in 1965–66. The current production of superphosphate is about 90,000 tons per annum (15,000 tons of P_2O_5). There is therefore immense scope for the production of phosphatic fertilisers.

Existing installed capacity for the production of superphosphate is 264,000 tons (44,000 tons P_2O_5). Further licences have now been issued so that the total installed capacity is expected to rise to 526,000 tons of superphosphate (equivalent to 88,000 tons of P_2O_5 per annum). One firm has been licensed for production of 16,500 tons of ammonium phosphate per annum (16 per cent N:20 per cent P_2O_5).

As in the case of ammonium sulphate, India is at present dependent on imported raw materials for the production of phosphatic fertilisers. While there is a proposal before the National Industrial Development Corporation for the production of phosphorus and phosphoric acid from rock phosphate by the electro-thermal method so as to avoid the use of imported sulphur in the production of phosphatic fertilisers, the import of rock phosphate itself seems to be unavoidable for some time to come.

Potassic Fertilisers. The requirement of K_2O by 1961–62 would be 37,500 tons, by 1965–66, 72,500 tons. At present only about 1,000 tons of muriate of potash are recovered as a by-product of salt and saltpetre production against actual consumption of 25,000 tons (15,000 tons of K_2O). The annual production of sea salt is about 3,000,000 tons and the bitterns which are now wasted contain over 50,000 tons of muriate of potash. The recovery of muriate of potash can be carried out relatively easily in salt works of large size. The rising demands for potassic fertilisers can be therefore met from indigenous sources. The Government propose to take suitable steps for the recovery of muriate of potash in the Government Salt Works at Kharagoda. Salt producers in the private sector are also paying attention to this matter.

Synthetic Ammonia. Considering the availability of cheap power, coal, coke oven or petroleum refinery or natural gas, the possibility of manufacturing different types of fertilisers at the following sites is being explored:

LOCATION	TYPE OF PRODUCT
Assam: Based on natural gas	Urea
Based on coals containing high sulphur	Ammonium sulphate
Refinery based on Assam crude wherever set up	Urea
Refineries at Bombay	Urea Nitrophosphate; double salt if Saurashtra gypsum of right quality is available in sufficient quantity
Koyna	Ammonium phosphate, nitrophosphate, triple superphosphate
Rajasthan	Ammonium sulphate preferably based on sulphuric acid from low grade gypsum
Mysore (Bhadravati)	Ammonium nitrate/nitrolimestone (ammonium phosphate/nitrophosphate/triple super)
Kerala	Ammonium phosphate, nitrophosphate, triple super
Andhra (Singareni and Ramgundam coal fields)	Urea
UP (Rihand)	Ammonium nitrate/nitrolimestone
Madhya Pradesh (Itarsi)	Urea
New steel factories and expansion of the existing ones; independent coke ovens that may be set up	Urea, if the coke oven gases are reformed to produce hydrogen and CO_2 Ammonia-nitrolimestone, if hydrogen alone is extracted
Caustic soda/chlorine plants (large units at Tuticorin, Bombay, Delhi, Alwaye, etc., and new ones that may be set up)	Dicalcium phosphate

TABLE 1

LOCATION	NITROGEN PER ANNUM (tons)	TYPE OF FERTILISER	EXPECTED TIME OF STARTING PRODUCTION
Sindri (expansion)	47,000	Urea and ammonium sulphate nitrate	1958
Nangal	70,000	Calcium ammonium nitrate	1959–60
Rourkela	80,000	Calcium ammonium nitrate	1959–60
Neyveli	70,000	Urea	1960–61
Alwaye (Kerala) Fertilisers and Chemicals (Travancore) Ltd. (expansion)	9,000	Sulphate of ammonia and ammonium phosphate	1960–61
Iron and steel works	6,000	—	—

Evans Medical Form Liberian Subsidiary

A CERTIFICATE of incorporation has been granted in Monrovia, Liberia, West Africa, to a new subsidiary of Evans Medical Supplies Ltd., Liverpool, UK. The new company, Evans Medical (Liberia) Ltd., came into existence on 18 December 1957 and its principal task will be to implement an agreement signed in August 1957 between the Government of Liberia and Evans Medical, in which the Liverpool firm were appointed sole purchasing agents throughout the world for an initial period of five years for all pharmaceutical products, dressings and medical equipment required by the Government of Liberia.

First managing director of Evans Medical (Liberia) will be Mr. R. H. Hawkins. Plans are reported to be well advanced for the construction of a building in Monrovia to house the large stocks of pharmaceutical products that will be needed. Special accommodation will be provided for products that require storage at low temperatures.

Analysis of Copper and Alloys

METHODS used by the metals division of Imperial Chemical Industries for the analysis of copper and its alloys were outlined and discussed at a meeting of the Society for Analytical Chemistry at Birmingham recently.

Under the title 'The analytical chemistry of copper and its alloys' Mr. H. J. G. Challis of ICI metals division referred in particular to physico-chemical methods developed for rapid control analysis. Comparison was also made with instrumental methods, e.g. spectrographic and the more recent direct-reading technique. Outstanding problems were emphasised and an indication given of future trends.

New BS for Low Density Polythene Rod

A NEW British Standard for low density polythene rod (BS 2919/1957) has been prepared primarily to meet industry's need for a rod to be used in conjunction with low density polythene tubes (as specified in BS 1973) and with low density polythene sheet, for which a standard is now being prepared.

The new publication specifies both black and natural polythene rod and provides for two grades with different metal flow indices. Requirements are specified for diameters and tolerances, as well as for physical properties. Copies may be obtained from the BSI sales branch, 2 Park Street, London W1, price 3s.

MORE NICKEL THIS YEAR, SAYS INCO CHAIRMAN

BARRING unforeseen large increases in defence demands, it is expected that there will be more nickel available for private industry this year than in 1957. This was stated by Dr. John F. Thompson, chairman of the board of the International Nickel Co. of Canada Ltd., in a year-end review of the nickel industry. As a consequence the supply/demand situation throughout the world this year should be in close balance. In the US Dr. Thompson suggests that, in view of the announcement of the US Government's desire to divert to industry all nickel scheduled for stockpiling, the supply in that country will exceed the demand.

A major task confronting all producers in the industry is the creation of larger markets in preparation for the time the nickel production capacity goal is realised in 1961. Production is expected to start in 1960 at International Nickel's new project in Manitoba, which will have an annual capacity of 75 million lb. Free world nickel-producing capacity by 1961 should be between 650 million and 675 million lb. a year. In 1957 free world nickel production was 490 million lb. which was a record, compared with the previous records of 450 million lb. in 1956 and 425 million lb. in 1955. Deliveries of the metal by the several Canadian producers are expected to reach a new high total of about 360 million lb., representing approximately 75 per cent of the free world's entire supply. Of the balance, Cuba is expected to account for about nine per cent; the US four per cent; and New Caledonia, Japan and others, 12 per cent.

International Nickel operated at capacity in 1957. The company's deliveries of nickel in all forms will exceed 290 million lb., some five million lb. above deliveries for 1956.

Of the free world's nickel supplies available in 1957, Dr. Thompson estimates that 60 per cent was delivered to the US, and 40 per cent went to Canada, the UK and other countries of the free world.

According to Dr. Thompson, while the industry should see remarkable changes in the next few years, the past year has not been without significance, for it saw an improvement in the supplies of nickel available for civilian consumption after many years of shortage. This change, as has been noted above, was due to sharply reduced defence demands and to the US Government diverting to industry during the year all nickel scheduled for the stockpile. Whereas in recent years 40 per cent of nickel supplies have been absorbed by defence and stockpiling requirements, in the past 12 months only about 20 per cent has been thus absorbed.

First Production of Aluminium Ingot At New Canadian British Smelter

LESS THAN 20 months after work commenced on clearing the site, the first metal was poured last week at the new aluminium smelter of the Canadian British Aluminium Co. at Baie Comeau in the Province of Quebec on the north shore of the St. Lawrence River, 400 miles north-east of Montreal.

One of Britain's most important investments in Canada in recent years, the company is a subsidiary of the British Aluminium Co. Ltd., and has been formed in partnership with one of Canada's largest pulp and paper companies, the Quebec Shore Paper Co.

The event marked the completion of the first of four production stages of the £50 million plant which will eventually have an annual capacity of 160,000 long tons of virgin aluminium ingot. As an indication of the size of the smelter, this ultimate capacity represents two-thirds of the present annual consumption of virgin ingot in the UK.

This first stage of the smelter, with a capacity of 40,000 long tons a year, like the other three stages still to come, has two furnace bays each a third of a mile long. Designed to be one of the most modern aluminium reduction works in the world, it is provided with a high degree of mechanisation and automation.

Power for the present requirements of the smelter is supplied from the hydro-electric installation of the Manicouagan Power Company, 11 miles away.

The aluminium production process requires about half a ton of carbon for every ton of metal produced. This is supplied at Baie Comeau from a carbon factory and the two main products are carbon paste for the anodes of the furnaces and carbon mixture for lining the furnaces. The plant is one of the most up-to-date and highly mechanised plants in the world. Treatment of the calcined coke from its withdrawal from storage in two 6,000 ton silos involves drying in a rotary oil-fired dryer and its separation into various size fractions from ½ inch to dust by screens, the finer sizes being made as required by reducing any excess coarse materials first in roll crushers and subsequently in an air swept ball mill. Predetermined quantities of each size fraction of coke are then blended and fed to the continuous mixers with molten pitch. The pitch is melted and all subsequent lines of the mixers kept hot by circulating hot hydrotherm fluid.

Work on the second stage of the smelter is already well advanced and will be completed by the early spring of 1959, when the company will have a production capacity of 80,000 tons a year of virgin aluminium.

Letters to the Editor

Pitfalls of Russian Translating

SIR, Your somewhat puzzling review entitled 'Further Soviet work on trimeric acrylates' (CHEMICAL AGE, 23 November, p. 845) typifies one of the pitfalls of translation, namely, the assumption that words of close similarity in two languages necessarily have the same meaning.

Drinberg has not succeeded in making insoluble acrylic trimers nor can any of the polymers described be classed as tripolymers, i.e. three-component copolymers.

The Russian word 'trekhmernyi' means not 'trimeric' but 'three-dimensional', and in this context could be translated as 'cross-linked'.

The paper in question deals with the cross-linking of soluble, linear, acrylic polymers to give insoluble products of three-dimensional, network structure.

Your etc.,

E. O. PHILLIPS

Slough, Bucks.

Our translator replies:

'I much regret the error pointed out by Dr. Phillips. This was not so much a stumble into a common pitfall—of which I am usually only too well aware—as a careless mistake, for which I can only plead pressure of work plus 'flu, in slight extenuation.'

Cambridge Instrument's Univector Polarograph

SIR, We read with interest your survey of papers presented at the recent symposium of the Polarographic Society (CHEMICAL AGE, 2 November, p. 721 *et seq.*) and would like to refer to your report of Mr. G. W. C. Milner's lecture, especially to the paragraph in which he compares the sensitivity of our Univector polarograph with that of the Mervyn-Harwell square wave polarographic equipment.

We feel that a person who is not familiar with our equipment might well assume from your report that our Univector polarograph actually competes on level terms with the square wave polarographic equipment manufactured by Mervyn Instruments Ltd.

If, however, in the fuller account of the proceedings (that the Polarographic Society intends publishing later on) mention is made of the fact that our complete Univector polarograph is available commercially at approximately one-quarter of the price of Mervyn Instruments' excellent square wave polarographic equipment, might not one of the German members of the society be justified in exclaiming, 'Das sieht schon besser aus! Man sieht doch wo und wie?'*

Yours, etc.

M. J. C. CASSIDY

Technical Publicity Department

Cambridge Instrument Co. Ltd.

London SW1.

*Goethe's 'Faust' (Schülerszene).

1957 WAS BUSIEST YEAR YET FOR US CHEMICAL INDUSTRY

CHEMICAL company executives in the United States consider that last year was the industry's busiest yet—with higher sales and output and increased expenditure for new plant and equipment and research. These are the findings reported in the annual review of the *Chemical and Engineering News* (6 January, 1958, page 66).

Industrial production, however, tailed off from 147 in December, 1956, to 139 in November (1947-49 equals 100). Production and sales of chemicals and allied products are shown to have levelled out since January, 1957.

Although chemical industry sales will be lower during 1957 than was first anticipated, the 1957 figure will still be a record one, probably totalling about $24 billion. The Manufacturing Chemists' Association year-end statement suggests a figure of $24.4 billion. But the Federal Trade Commission reports show that although chemical industry sales for the first nine months in 1957 were up 7 per cent over 1956, profits after taxes were only up 3 per cent.

Chemical investment expenditure is reported as high. Planned spending at $441 million is down 16 per cent from the past quarter compared with the decline of 19 per cent a year ago, and compared with the first quarter of 1957 the figure is increased by $88 million. Total 1957 outlay is estimated, according to the survey, at $1.75 billion compared with the predicted $1.8 billion.

Polythene Expansion

The most noteworthy expansion has been in polythene. This has caused an 'unprecedented' ethylene demand and expansion. Currently, 21 polythene plants are stated to be operating or under construction.

Basic chemicals are reported as having continued their steady expansion during the year, with chlorine and caustic soda in the lead and ammonia active.

The *C and EN* survey notes a considerable number of chemical company mergers.

It is noted that chemical industry profits at the end of 1957 were under pressure because of manpower costs, containers, fuel, freight, etc., and at the same time the industry's best customers have levelled off or even fallen off. Another point shown by the survey is that there is, in many instances, excess capacity with consequently increased competition within the industry. Selling prices have not kept pace with costs, either, so it has been difficult for US chemical manufacturers to maintain earnings at previous levels.

Pharmaceutical manufacturers are recorded as having an excellent year. Due to the new drug products developed in pharmaceutical research laboratories, earnings are stated to be at unprecedented high levels for most companies in the field. These higher earnings also show in the increased payments to stockholders (better than 5 per cent compared with the previous year).

On the chemical side only a 'handful' are said to show a net advance for the year as a whole. On the average, the *C and EN* survey indicates that chemical shares listed on the New York Exchange in December last were about 10 per cent below the level in January, 1957. In contrast, pharmaceutical shares have made money and stocks show a gain of 25 per cent since the beginning of 1957.

A fall of 30 per cent is listed for the minerals and fertilisers in *C and EN*'s group, due to the falls in sulphur prices.

What are US economists' views on 1958? The Manufacturing Chemists' Association in a note to *C and EN* state a 5 per cent increase is forecast for 1958. More than $1 billion in capital investments by the industry in 1958 is expected. It is considered profit margins should improve.

One economist unit (White, Weld and Co.) points out that 'excess capacity and generally higher producers' inventories will probably make the chemical industry especially sensitive to variations in general business activity.' There is also the hint that several chemical companies could report significantly lower 1958 earnings if there is any fall in general business levels.

Another economic opinion is that '1958 must be reviewed as another year of transition for the industry'. Small gains in sales of the order of 5 per cent and no change in earnings are expected. The suggestion is made that the US chemical industry is capable of expanding earning power by roughly 40 per cent with full realisation of facilities.

A further view is that total chemical industry earnings are expected to decline somewhat in 1958. 'The stretching out of current plans will probably reduce (1958's) expansion by a greater amount than is currently indicated' (Arnold Bernhard and Co.).

A continuation of the 1957 pattern of some sales increase, which will be insufficient to fully overcome pressure on profits, is foreseen by others. The suggestion is also made that new products and processes will tend to counterbalance contractions in regular business.

Anti-dumping Duty on French Silicones

FIRST order to be made under the Customs Duties (Dumping and Subsidies) Act, 1957, by the Board of Trade is an anti-dumping duty on imports of silicone fluids and emulsions from France, following representations in April, 1957, by UK manufacturers of silicones—Nobel division of Imperial Chemical Industries and Albright and Wilson's Midland Silicones subsidiary.

The BOT state that the circumstances have been fully examined, and it is 'satisfied that dumping has been taking place and, in the case of fluids, is still continuing, and that such dumping is causing material injury to a UK industry.' An additional duty of 4s per lb. has therefore been imposed with effect from 6 January on polymethylsiloxane fluids originating in France and manufactured by Société des Usines Chimiques Rhône-Poulenc.

The French company and importers and users in this country opposed the UK industry's application. Imports of all silicones have been running at an annual rate of some 500,000 lb. to a value of about £500,000. Prior to UK production of silicones, these materials were imported from the US.

More UK Chemicals Shipped to Far East

THE chemical industry has taken over the role of leading exporter to Hong Kong, shipments of its products being increased from £2.9 million to £3.7 million, states the annual report of the China and Far East Section, Manchester Chamber of Commerce, presented to members at its meeting on 3 January.

Regarding Indonesia, the report observes that of the major exporting groups only one, chemicals, at £2.3 million improved over the 1956 performance.

The two major items exported to China in 1957 were again chemicals and raw wool. 'Chemicals showed a remarkable increase from £900,000 to £2.3 million,' the report observes.

Chemical firms also increased exports to Japan, from £1.6 million to £2.1 million.

Work Study in Industry and Agriculture

CHEMICAL industry workers will be among those taking part in a joint industrial and agricultural conference to be held at 21 Tothill Street, London SW1 on 19 February on the subject of work study in farm, field and factory. The conference is organised by the Association of Agriculture, the British Institute of Management and the Institution of British Agricultural Engineers.

Speakers include: Mr. R. M. Currie, head of ICI's central work study department, and Mr. G. W. Lugg, head of ICI's agricultural work study unit. Dr. W. H. Garrett, personnel director of Monsanto Chemicals, will introduce discussion on Mr. Lugg's paper. Mr. P. J. Torrie, head of the training section of ICI, the ICI central work study department, will be chairman at an open forum which will conclude the conference.

DYEING CHARACTERISTICS OF WOOL DYES

Rate of Strike and Migration

WHEN speaking on 'New methods for the assessment of the dyeing characteristics of wool dyes' to the West Riding Section of the Society of Dyers and Colourists, Dr. H. R. Hirsbrunner (Geigy Co. Ltd.) began by reviewing the methods of assessing the dyeing characteristics of wool dyes which are mainly used today. He said that although by no means the only factors which control the dyeing operation, the ones usually assumed to be of the greatest importance were: (1) Rate of strike. (2) Migration.

Since the majority of the experimental work carried out had been done using level dyeing acid dyes, there had been a tendency to regard the migration as the most important factor. The industry as a whole, was, however, turning from the level dyeing acid dyes to the fast-to-washing dyes for many purposes and, except for the chrome dyes where a separate developing process was carried out at a later stage, fast-to-washing shades could not be achieved with dyes of good migration. Of primary interest had been the careful examination of the rate of strike of the acid and premetallised dyes which possessed low migration. Two additional tests had been used in the Geigy laboratories for some time, stated Dr. Hirsbrunner.

Shading Test

In the shading test, three samples of a tightly woven wool serge, the seams of which had been frayed open, were entered into a boiling blank dyebath set with the same dyeing assistants as used in practical dyeing, and treated for 15 minutes. Then 0.05 to 0.1 per cent of dye was added and the three samples were dyed for 2, 5 and 15 minutes respectively. If the edges were dyed to a similar depth to the whole surface, the dye was said to be suitable for shading at high temperatures. If the frayed edges were much darker than the remainder of the serge, the dye was said to be unsatisfactory for this purpose.

In the test for the acid requirements of a dye, four samples of wool serge were dyed successively for 15 minutes in the same dyebath at the boil. The first dyeing was carried out neutral, the second and third with the addition of 1 per cent acetic acid 40 per cent and the fourth with 1 per cent formic acid 85 per cent, each addition of acid being made before commencing the successive dyeings. By visual examination of the colour yield of the four successive dyeings, it was possible to place the dye in one of three categories: (a) Those exhausting adequately under neutral conditions, e.g. Irgalans. (b) Those exhausting adequately under slightly acid conditions, e.g. Irganols. (c) Those requiring acid or formic acid for exhaustion, e.g. mainly acid milling dyes.

Dr. Hirsbrunner said that this test was very useful when examining mixtures of dyes to determine their compatibility.

One fault with these methods of test was that the degree of circulation in the dyebath depended on the human factor. This was not very satisfactory since the degree of circulation had a considerable effect on the rate of strike. For this reason, Geigy had devised a further test where mechanical agitation was used.

The time of half dyeing at 90°C at pH7 was determined for a range of Irgalan, Irganol, and Polar dyes by using this apparatus, and the results are shown in the following table.

Neutral Drawing Test at 90°C (194°F) at pH7

Dyestuff Irgalan	*% Exhaustion*	*Dyestuff Irgalan*	*% Exhaustion*
Yellow GL	35	Brown 2GL	56
Yellow 2RL	62	Brown FL	45
Orange RL	61	Brown 2RL	52
Red 4GL	36	Dark Brown 5R	75
Red 3G	64	Brown 7RL	74
Red 2BL	47	Brown 3BL	52
Rubine RL	57	Brilliant Green 3GL	34
Bordeaux 2BL	70	Grey BL	48
Violet 5RL	51	Olive BGL	55
Violet 4BL	53	Navy Blue 5RL	41
Brown Violet DL	58	Black RGL/GBL	23
Blue GL	65		
Blue RL	45		
Polar		*Polar*	
Yellow 5GN conc.	42	Violet B conc.	9
Yellow R. conc.	26	Brilliant Blue GAW	52

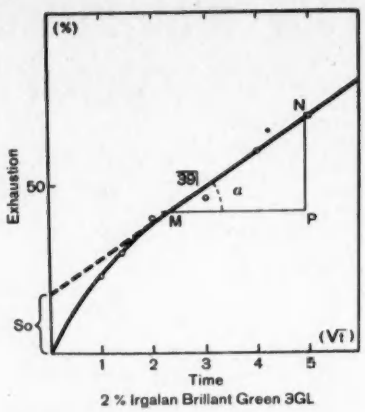
These show the remarkable similarity between the members of the Irgalan series as compared with the other ranges.

Another new test which was proving of great interest was illustrated (Fig. 1). This graph was prepared by plotting the percentage exhaustion against the square root of time. The curve shown is stated to be typical of that obtained with a 2:1 metal complex dye of the Irgalan type. It would be seen that for this type of colour, dyeing proceeded in two distinct stages. (1) High initial surface absorption or strike; and (2) constant rate of strike which was represented by the linear part of the graph.

This second stage was represented by tangent alpha or V value (V = velocity). If this straight line was extended to go through the vertical axis, it would give an intercept value shown as 'So'. A large intercept value corresponded to a high initial strike of the dyestuff.

Illustrations were then shown by Dr. Hirsbrunner of several series of cheese dyeings indicating that whereas the Irgalan type of dye struck level and penetrated well from the first moment of dyeing, this was not the case with unmetallised dyes. This, he concluded, was the fundamental difference between the 2:1 metal complex dyes and dyes of other types. He went on to say that, providing the circulation was adequate, the initial rate of strike ('So' value) was of virtually no importance with the Irgalans but that the rate of dyeing as represented by tangent alpha was the important factor. By assessing these two values for the 2:1 metal complex dyes at various temperatures, it was possible to predict the comparative level dyeing behaviour much better than on the results of the previous types of test.

Dr. Hirsbrunner then showed how these tests had provided the information from which the Irgalan high temperature dyeing method had been formulated. This was a principle very similar to the method put forward by F. L. Goodall for dyeing highly aggregated dyes, but it had been found to be much more successful in practice with the Irgalan range than with other groups of dyes, probably for the reasons already given.



2 % Irgalan Brillant Green 3GL

Only by using this type of dye, said Dr. Hirsbrunner, would the dilemma of having to apply non-migrating dyes with the same satisfactory levelness in bulk practice as had previously been obtained with the level dyeing acid dyes, be solved.

Recovery of Spent Acid Pickle Liquor

A METHOD of recovering waste sulphuric acid pickle liquor was described by Mr. W. H. Bullough at a recent meeting of the Iron and Steel Institute at Church House, London. The paper described the 'BISRA autoxidation process for acid pickle liquors' which was devised by the spent pickle liquor sub-committee of the British Iron and Steel Research Association.

It was decided that the best solution for the problem was to extract the ferrous sulphate from the liquor and return the mother liquor containing the unused acid to the pickle tanks. The ferrous sulphate could then be converted to sulphuric acid and iron oxide.

The sub-committee recommended that the process should be tried on a scale of one ton of 100 per cent sulphuric acid a day. Accordingly, Simon-Carves Ltd., in collaboration with BISRA, designed and erected a plant in the King's Dock works of the Steel Co. of Wales Ltd., Swansea. Trials had indicated that this process was practicable and economically justified for a large pickling plant.

Latest Blue Book Now Available from Stationery Office

Known as the 'Blue Book', the report of the standing advisory committee on the carriage of dangerous goods and explosives in ships is now on sale from HM Stationery Office, price 25s (by post 26s 9d). The committee was set up in May 1952 so that the 1951 Blue Book might be kept up to date. This report supersedes the 1951 publication.

NZ WORK ON DETERMINING MERCURY CONTENT OF APPLES

DETERMINATIONS of mercury have been made on untreated apples and apples treated with phenyl mercuric sprays by H. M. Stone, P. J. Clark (Dominion laboratory, Wellington) and H. Jacks (Plant Diseases Division, Auckland, Department of Scientific and Industrial Research). (*N.Z. J. Sci. Tech.*, 1957, **B38,** 843.)

These determinations were made to ascertain the level of mercury that could be expected with different numbers of sprays. The proprietary fungicides used in New Zealand for black spot on apples are Venturicide and Ascospray, which contain two per cent to two-and-a-half per cent phenyl mercuric chloride.

To estimate the residual mercury on the skins of apples, apples were collected during four seasons from experimental orchards. The pulp, core and pips of apples picked during the latter two seasons were examined to determine natural mercury content and any increase caused by spraying.

Mercury was determined by a modification (Stone *et al. N.Z. J. Sci. Tech.*, 1954, **B35,** 301) of a method of Klein (*J. Ass. Off. Agric. Chem. Wash.*, 1952, **35,** 53) consisting of acid digestion of the fruit, colour development with dithizone, and spectro-photometric measurement of the mercuric dithizonate at 490 mμ Stone *et al* claim that the method will accurately determine mercury within the range of 0.1 to 2.0 μg. and on a 2 lb. sample of which a $\frac{1}{10}$ liquid aliquot is taken for the colour development this represents between 0.001 p.p.m., and 0.02 p.p.m.

Peelings, pulp, core and pips from a weighted amount of fruit (about 2 lb.) were digested separately, aliquots taken for analysis and the results expressed as parts per million of mercury calculated on the weight of the whole fruit.

Results

The results show that where applications ceased at closed calyx, residual mercury did not exceed 0.05 p.p.m., but when the interval between the last spray and the picking was two months or less, the residual mercury was commonly higher than 0.05 p.p.m.

Among varieties where a number of analyses were made it was found that the mercury content of pulp increases with increasing numbers of applications. In Sturmers, Dougherty, Delicious and Granny Smith apples, applications of phenyl mercuric sprays to apple trees results in an increased mercury level in the pulp. Analysis showed that a mercury content of pulp of 0.09 p.p.m. was possible if spray applications were made throughout the season but in apples sprayed not later that the closed calyx stage and receiving no more than five applications of phenyl mercuric sprays, the highest mercury level found in pulp was 0.040 p.p.m.

In Stone *et al's* present experiments values as high as 0.017 p.p.m. in the skin and 0.006 p.p.m. in the pulp were obtained from untreated apples. Among apples receiving not more than five applications, only one sample was found to have a mercury content in skin and pulp exceeding 0.05 p.p.m. Apples sprayed later in the season contained as much as 0.135 p.p.m. It is suggested, therefore, that 0.05 p.p.m. would be a practicable limit for total mercury in apples. Application of phenyl mercuric sprays should therefore be confined to the early part of the season and should be discontinued preferably after the closed calyx stage.

67th 'Red Book' Now Available

THE 67th edition of 'Electricity Undertakings of the World,' commonly known as 'The Red Book,' is now available from Benn Brothers Ltd., Bouverie House, 154 Fleet Street, London EC4, price 30s, or 32s including packing and postage.

A new departure in this edition is the inclusion of brief details of the nuclear power stations to be inaugurated in the immediate future by the Atomic Energy Authority. Details of electricity authorities overseas follow the same design as in previous editions and have been subjected to thorough cross-checking with the organisations concerned. This edition includes 30 new entries from the US, 16 from the Belgian Congo, further entries from French Equatorial Africa, North Borneo, and Guatemala, which now total 20 entries.

New Barytes Treatment Plant

A TREATMENT plant to separate barytes from shale and to prepare a milled product ready for the market has started operating at Quorn, South Australia. This plant is owned by South Australian Barytes Ltd., which in 1946 took over the assets of the Blinman Syndicate, formed to secure mineral leases of 200 acres in the Flinders Range, from which barytes had been produced in small quantities by excavation of load crops.

Barytes in the load material is stated to average better than 97 per cent $BaSO_4$. Silica content is almost two per cent and the Fe_2O_3 is approximately 0.1 per cent. Output of barytes since 1949 has steadily increased and consequent upon the Australian Department of Mines sample survey in 1953, a milling plant was seriously considered. In 1956 the South Australian Government agreed to provide a bank guarantee of £200,000. S. A. Barytes Ltd. will be capable of meeting its new commitments on the additional capital expenditure by recovery of material accumulated in dumps.

The plant layout has been designed to give minimum movement of the ore during treatment. Ore, unloaded from 30-ton trucks in a siding to the plant, drops to a shallow hopper above the feeder to the crushing section. The fine ore storage bin is adjacent to the mineral dressing section. The cleaned barytes is transferred in a dry launder to the fine grinding section. The lagging unit is at the entrance to the product storage building, having a capacity of 1,500 tons.

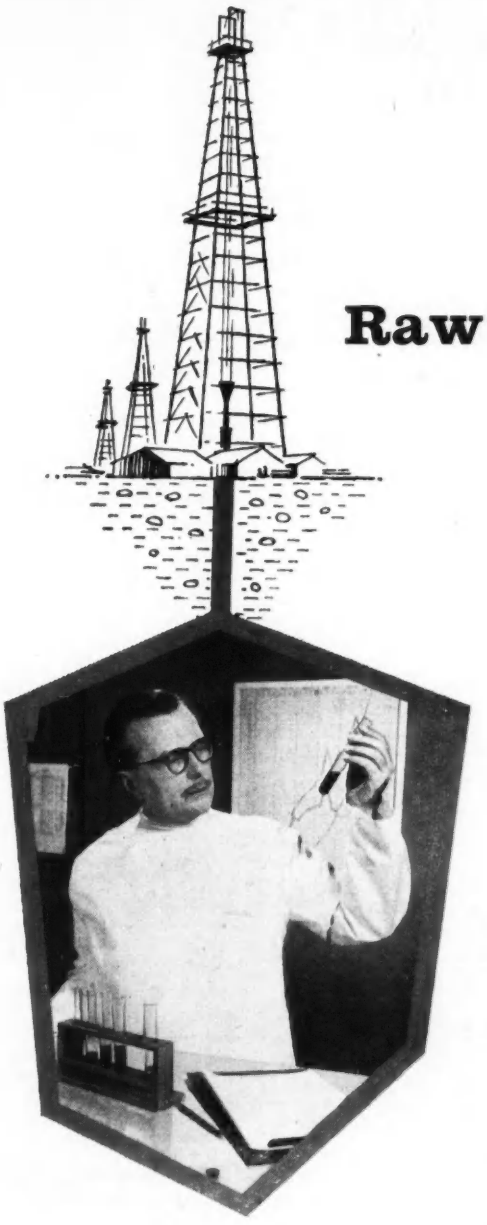
Rated capacity of the crushing section is 30 tons an hour. This is somewhat greater than necessary to meet the needs of the dressing section but is dictated by the size of the primary crusher. The drying and pulverising section has a capacity of three tons per hour. Sufficient floor space has been left to duplicate this section or to install a larger machine if necessary to increase output.

The grade of barytes produced at Quorn will meet Australian Standard Specifications whenever they apply. Current world production of barytes is 2,500,000 tons per year. Australian consumption is about 5,500 tons per year.

Present uses for barytes are: in the paint industry as a raw material for lithopone and as a competitor to rutile; in drilling mud; as a filler for rubber, textile and paper; asphaltic floor material; in shielding concrete used for atomic reactors and X-ray rooms. It is considered that the uses listed below, however, may in some cases become an important sales outlet: additive to glass, use in heavy underwater concrete, glazing in ceramics, use in printing inks, linoleum, plastics, storage batteries, explosive cartridges, and waterproof clothing.

Triplex Chairman Operating Electron Microscope

Sir Graham Cunningham, chairman and managing director of the Triplex group of companies, operating the electron microscope at the group's new fundamental research laboratory at Balsall Common, Warwickshire.



Raw materials of success

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Esso who have pioneered so much in the oil industry are also pioneers in the petrochemical industry. They have much to offer to the great British chemical industry.

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MEANS BUSINESS IN CHEMICALS

ESSO PETROLEUM COMPANY, LIMITED, 36 QUEEN ANNE'S GATE, LONDON, S.W.1

Overseas News

CANADIAN CHEMICAL LEADERS LOOK ON 1958 WITH CONFIDENCE

CANADIAN chemical industry leaders, in reviews of conditions, state that 1957's business was good and that outlook for 1958 is favourable.

Mr. A. A. Cumming, president of Union Carbide Canada Ltd., declared that sales estimates for his company's products indicate a somewhat higher level of business in 1957, compared to 1956. He forecast that 1958 business of his company would be on a level with 1957, although it was expected there would be a shift in pattern from alloys to chemicals and plastics.

Canadian economy was passing through a difficult period, although it should be possible to avert a serious decline during 1958, said Herbert H. Lank, president of Du Pont Company of Canada (1956) Ltd. He added that for the next several months the demand for industrial goods will be reduced as excess inventories are liquidated and also that capital investment has apparently passed its peak and could have a marked effect towards the end of next year.

General manager of Pfizer Canada, Mr. F. W. Lockhart, declared that overall outlook for 1958 was good generally with new, clinically backed speciality products expected to find a ready market through the medical profession.

Mr. Leo E. Ryan, president of Monsanto Canada Ltd., said that Canada depended very much on external trade and it was therefore most encouraging to see that in latter months of 1957, a trend toward a lower deficit in balance of external trade occurred. He pointed out that the Canadian chemical industry suffered from importations as Canada's tariffs on chemicals permitted easy access to the Canadian market.

Mr. H. Greville Smith, president of Canadian Industries Ltd., said that sales of chemicals and allied products industry in 1957 were about 5 per cent above level of previous year and though industrial production has declined in recent months, chemical sales should continue to rise in 1958. He said that capital outlays by Canadian chemical manufacturers were higher in 1957 than in 1956, but below the peak of $141 million established in 1952.

Dutch Refinery Expansion

Early in 1958 the Esso Nederland NV, a subsidiary of the Standard Oil Co. (N.J.), will start the construction of an oil refinery in Holland, to be situated at the third petroleum harbour in the Botlek area on the southern bank of the waterway which connects Rotterdam with the North Sea. This refinery, which is expected to be opened early in 1960, will have a capacity of 4½ million tons of crude oil a year. The oil to be refined will originate, in part, from domestic sources, and a considerable part of the output will be exported. Automation will be applied in all stages of the refining process. Constructional work on a 430-acre site will as far as possible be entrusted to Netherlands suppliers. Tanks with a total storage capacity of 24,720,300 cu. ft. will be erected. Total staff will number about 500. This new refinery will necessitate an investment of fl.180m. (£18 million).

Dominion's Ontario Fertiliser Plant

Construction is due to begin this month on the new superphosphate plant of Dominion Fertilizers, of Canada, at Port Maitland, Ontario. The plant is due to be completed by this summer.

Pakistan's First Fertiliser Plant

The location of Pakistan's first fertiliser factory has been decided. It will be built by a Japanese steel company at Fenchugani, about 130 miles north-east of Dacca. Cost is stated to be Rs150 million (£11.28 million).

German Companies Recent Reports

Th. Goldschmidt AG, Essen, report a 10 per cent increase in sales over last year for January-October, 1957. Knapsack-Griesheim AG, Knapsack, report that the demand for cyanamide still outstrips production in spite of operational improvements, and sales of phosphorus products are increasing. The company's new carbide furnace is stated to have worked well.

Dutch Chemical Works in Eire

A chemical factory is to be established in Sligo, in Eire, by the Royal Industrial Co. Noury and Van der Lande chemical works.

French Enquiry for Acetylene Black and Carbon Black

Société Lamotte et Coiffard, 38-46 rue Raspail, Ivry sur Seine (Seine) wish to represent UK manufacturers of acetylene black and carbon black. Manufacturers interested in this enquiry should write direct to the French company.

Plant for Hydrogen Peroxide

Du Pont of Canada announce that construction of a $2,000,000 plant to produce hydrogen peroxide has started at its Maitland, Ontario, works. The plant is expected to be completed by late spring.

German Chlorine Production

According to Feldmühle Papier und Zellstoffwerke AG, the production of chlorine in Federal Germany is under expansion and will exceed domestic demand after 1958. Feldmühle have increased chlorine production. The increase in 1956 was 37,000 tons or three times as much as in 1949.

In view of the surplus chlorine expected after 1958, Feldmühle are to invest substantially in petrochemical facilities at Lülsdorf.

Cambodian Industrial Expansion

Industrial projects planned in Cambodia in the near future include the setting up of a company to develop chemical and pharmaceutical industries with a capital of 5 million riels (about £50,000), called Société Khmere d'Expansion Chimique, and another company, Labora Tores Khmere de Produits Pharmaceutiques.

More Chemicals from Poland

Quota lists have been drawn up between the UK and Poland for trade between the two countries. Among other things these provide for greater exports of chemicals from Poland to the UK.

Spanish Detergent Company

The Ferro and Cros groups in Spain are reported to have established a company for the manufacture of detergents on a large scale. Known as Compania Iberica Detergentes SA, it has a capital of 60 million pesetas (£510,000) and is to build a factory at Aranjuez, near Madrid.

US Investments in Italian Chemical Industry

Abbott Laboratories of North Chicago, and Abbott Laboratories Europa (Chicago) are investing an equivalent of 10 million lire (£571,000 approximately) in the operation of increase of capital of Abbott Laboratories SRL in Rome. The Italian company, which is a pharmaceutical manufacturing company, will use the extra capital for the installation of additional plants.

Hercules Ideas on Cellulose Acetate

Termination of cellulose acetate manufacture at its Parlin, New Jersey plant, is being considered by the Hercules Powder Co. It is reported that Hercules' increasing interest in polyolefins chemistry has made the company devote more efforts and labour to 'more promising operations' than cellulose acetate.

Superphosphate Company Reduce Dividend

Profit of the Albatros superphosphate factories at Utrecht and Rotterdam in the Netherlands fell during the year 1956-1957 to fl.13 million (approx. £740,000) compared with fl.15 million (approx. £754,000). The dividend will be lowered from 8 to 7 per cent.

Exports of superphosphate were substantially lower but there was an improvement of trade with Canada.

Dow of Canada to Produce Polystyrene Foam

Dow Chemical of Canada are building a plant at their Sarnia, Ontario, site for the first Canadian production of polystyrene foam. The new product will be processed

from polystyrene—already produced by Dow. The product will be expanded to produce a sparkling white, non-interconnecting cellular structure. Qualities include light weight, low thermal conductivity, inherent water resistance and high compressive strength.

The new plant—expected to come on stream next spring—brings to 14 the number of plants operated by Dow in Canada's spreading chemical valley.

Increased Turnover by Israel's Fertilisers and Chemicals Co.

An increased turnover from I£13.5 million to nearly I£20 million (£2.7 million to £4 million) in 1957, a substantial improvement in the company's financial position, is reported, since the Israeli Government have consented to the conversion of I£8 million (£1.6 million sterling) of loans advanced to the company in shares. The Government has also agreed to transfer two of its units—the plant for phosphoric acid production and the plant for production of phosphate salt manufacture—in exchange for 1£4 million worth of shares.

Chilean Fertiliser Company Closed by Import Competition

The Chilean phosphate fertiliser manufacturers, SA Cemento Juan Soldado Consolidada, have requested permission to close down their business. They state that the industry has become uneconomical through competition from imports.

Importation of fertilisers in manufactured form has been allowed for some time but a recent decision to allow the duty-free import of several items classified as raw materials has had severe repercussions on the trade. The company states that these materials are generally regarded as finished materials ready for use.

Malaya's Rubber Research Aims

A meeting is to be held early this year in Kuala Lumpur between the Federal Government of Malaya and representatives of the rubber industry to co-ordinate the Blackman committee recommendations (see CHEMICAL AGE, Vol. 78, 21 September, 1957, p.441) for a future research programme for the industry. In particular, the meeting will discuss the appointment of a special officer to carry out research who will draw up a plan under the control of the committee.

Italy's Adverse Balance in Chemicals

In her overseas trade in chemicals in the nine months January to September, 1957, Italy had an adverse balance of 11,543 million lire (about £6.6 million). Value of Italian imports and exports of certain chemical products in that period, expressed in million lire was as shown at foot of page.

A comparison of Italian imports and exports during January to September 1957 with last year's results appears below:

IMPORTS

	Jan./Sept. 1957 Tons	Increase or decrease %
Explosives and inflammable compounds	1,484	+35
Chemical fertilisers	112,321	+3.2
Anticryptogammics and pesticides	5,712	+34
Soap, glycerine, and wax products	16,071	—21
Pharmaceutical chemicals	5,525	—38
Synthetic rubber	15,822	+25.7
Plastics materials and synthetic resins	13,684	+3.8
Other inorganic chemicals	70,691	+17.6
Other organic chemicals	55,043	+14
Miscellaneous chemicals	89,450	—24

EXPORTS

	Jan./Sept. 1957 Tons	Increase or decrease %
Explosives and inflammable compounds	1,058	—70
Chemical fertilisers	478,032	+7
Anticryptogammics and pesticides	26,936	+170
Pharmaceutical chemicals	1,957	+3.6
Plastics materials and synthetic resins	23,807	—6
Other inorganic chemicals	87,264	+16
Other organic chemicals	55,707	+15
Miscellaneous chemicals	358,603	+22.6

Carbide Take Over Visking Assets

Union Carbide Corporation has taken over the assets and undertakings of Visking, of Lindsay, Ontario. Visking's produce food casings used by packers for processed meat and sausage products, as well as polythene film and belting. Another Visking plant is under construction in Winnipeg.

SBA—Kellogg Process for Acetylene from Natural Gas

Flexibility is stated to be the keynote of a new process developed by Société Belge de l'Azote (SBA) of Liége, Belgium, and M. W. Kellogg Co., US, for the continuous production of acetylene and ethylene from naphtha or natural gas. Acetylene is the major product when natural gas is used as the basic raw material.

A specially-designed burner which works continuously and requires little attention, is claimed to be easy to operate and to produce a constant yield. Traces of residual heavy hydrocarbon compounds which may be present in the final products are removed by special equipment. Heavy acetylene materials and the hydrocarbons are removed first, leaving acetylene and other lighter materials. Acetylene is then removed from these lighter materials, which are composed mainly of ethylene, hydrogen and carbon monoxide.

Israel Plans Potash Pipeline to Mediterranean

Mr. Jacob Sensibar, president of the Construction Aggregates Corporation, has in New York outlined a plan to build a pipeline from the Dead Sea to the Mediterranean for the transport of up to 1 million tons a year of potash and chemically pure salt. Preliminary plans indicate an annual revenue of between $10 and $30 million from the production of potash from the Dead Sea at the rate of 300,000 to more than 1 million tons a year.

New Chemical Works in Catania

Over eight milliard lire (£4,484,000 approximately) will be spent on the 26 new factories that are being built or planned in the so-called industrial area of Catania. These new factories include plants for processing of petroleum products, plastics materials, bitumen, and rubber, as well as plants for the production of paper, dyestuffs, pharmaceutical products, and liquorice.

So far, 2,300 million lire (£1,289,230) have been spent on the construction of 13 factories already operating in the industrial area of Catania.

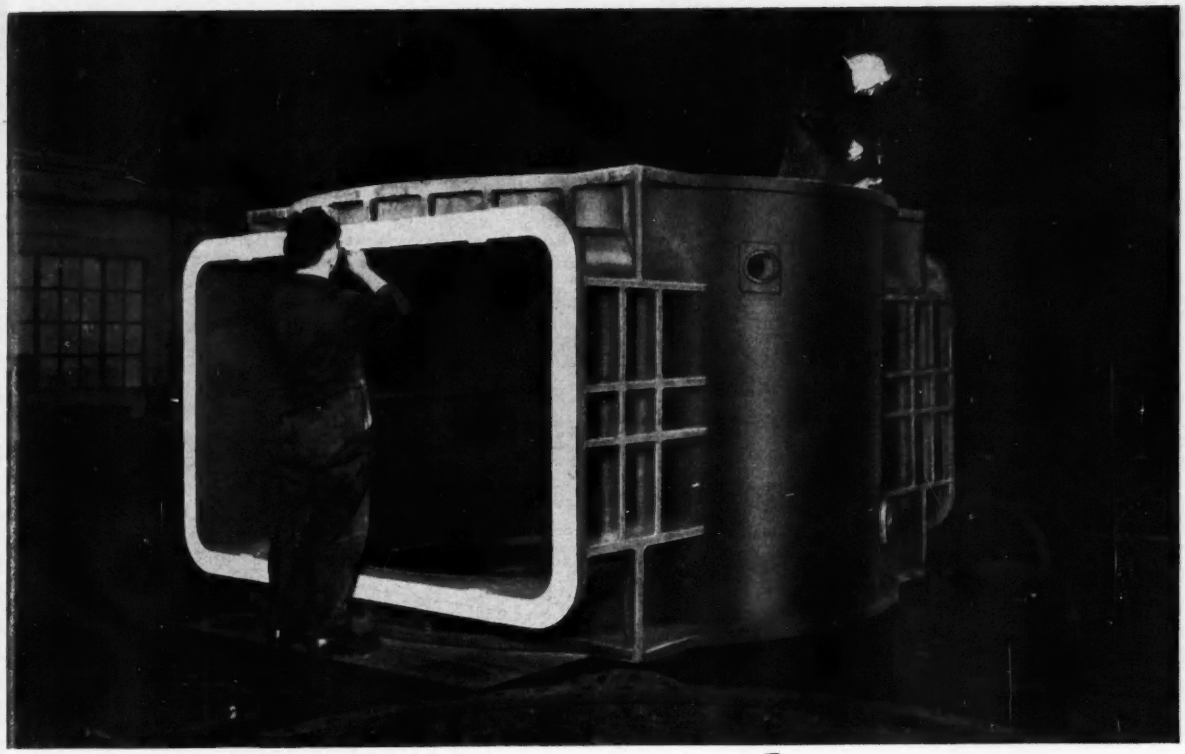
	Imports	Exports	Balance
	(in million lire)		
Explosives and inflammable compounds	599	434	— 165
Chemical fertilisers	2,980	15,334	+ 12,354
Anticryptogammics and pesticides	1,486	1,672	+ 186
Pharmaceutical chemicals	11,783	10,428	— 1,355
Extracts for dyes and tanning	611	1,839	+ 1,228
Paints, lacquers, varnishes, enamels	5,593	2,654	— 2,939
Inks, dextrine, glues, etc.	1,665	122	— 1,543
Essential oils and essences	628	4,956	+ 4,328
Synthetic rubber	6,057	2	— 6,055
Plastics materials and synthetic resins	6,477	8,978	+ 2,501
Other inorganic chemicals	9,494	5,926	— 3,568
Other organic chemicals	13,579	11,461	— 2,118
Miscellaneous chemicals	15,850	6,058	— 9,792

Synthetic Natural Gas by Radioactive Conversion of Coal

WHAT may be the beginning of a more economical route to a synthetic natural gas has been reported by Ernest J. Henley, William Karns and Raymond Thomas of Columbia University, US. These workers, with financial support from Consolidated Natural Gas, a New York pipeline company, are studying the possibility of making such a gas from coal by means of radioactivity.

Basically their process is a carbon plus hydrogen reaction. Low-grade coal or coke is heated at high temperatures (1,000°F) and at high pressures (up to 3,000 p.s.i.) with some added hydrogen in the reaction vessel and is exposed to a 1,400-curie cobalt-60 source. No attempts to obtain a high conversion rate have been obtained as the effects of radiation are the main study. To be commercially effective in producing synthetic gas, it is reported that the process would have to produce gas at the rate of 850 or more BThU.s.

Studies completed to date suggest that radiation catalyses the reaction. More data are promised by the Columbia workers in a few months' time. No plans are contemplated at the present for extending the present laboratory investigations to a pilot plant or larger plant.



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ADSORPTION OF FROTHING AGENTS DISCUSSED BY DR. JOWETT

TESTS described in a paper presented at the Institute of Fuel on 8 January by Dr. A. Jowett, a former senior research officer, Coal Research Station, Commonwealth Scientific and Industrial Research Organisation, Australia, and now at the department of mining, Leeds University, dealing with 'Influence of the adsorption of frothing agent on the percentage recovery of coal from flotation pulps' were designed to solve amongst others the problem of whether the frother concentration was proportional to the concentration of fluid or solid. This problem is of considerable importance in flotation testing.

Two papers have previously been published on the problem of adsorption of agents. The first was by Eveson, Ward and Worthington (*J. Inst. Fuel*, 1956, **29**, 540) and dealt with the rate and extent of the adsorption of phenol by coals of various ranks and with the practical limitations of the results. The authors were not able to accurately investigate the adsorption of phenol because of the short time period. In the second paper, by Rogers, Simpson and Whelan (*J. Inst. Fuel*, 1956, **29**, 545) the significance of adsorption was not mentioned.

In the present paper, Dr. Jowett dealt with aspects of the problem of adsorption not covered in the above-mentioned two papers. In particular it was concerned with the practical significance of adsorption so far as it influenced the technique of coal flotation, especially conditioning methods.

Batch flotation tests by Dr. Jowett indicate that a cresylic acid frothing agent is removed rapidly from solution in flotation pulps by many Australian bituminous coals, and that the rate of removal of frothing agents is directly proportional to the pulp density.

For a specific sample of coal the percentage recovery from a flotation pulp was shown to be dependent only on the concentration of frothing agent in solution. It is reported that pulp density and conditioning time are involved only in so far as they influence the concentration of the frothing agent. A prolonged conditioning period, Dr. Jowett reported, must lead either to low recoveries of coal or to excessive reagent consumption, depending on the quantity of reagent added initially.

If raw oil is added, it is stated that it will dissolve only slowly, and there will be an optimum conditioning time since the concentration of frothing agent will approach a maximum as oil is dissolved, the maximum being reached when the rates of solution and of adsorption are equal. However, if the reagent is already in solution in water when added to the pulp, the maximum concentration of frothing agent will be present at zero conditioning time. Also, if an unstable oil-water-emulsion is added, the oil will be dissolved in a few seconds.

Any so-called conditioning process, Dr. Jowett reports, serves merely as a mixing process, and an apparatus giving intensive mixing and having a retention time of only a few seconds (e.g. a centrifugal pump) will give maximum yield of coal with minimum consumption of frothing agent.

Apart from excessive reagent consumption, Dr. Jowett considers other adverse conditions likely to be experienced in the operation of a large tank conditioner are a heavy, sticky, over-stable froth often the consequence of an excess of reagent, the ash content of the clean coal is likely to be greater than it need be, and difficulties may be experienced in the filtration of the froth.

RABRM Publish Research Work on Calcium Carbonate Fillers

DURING the past few years the Research Association of British Rubber Manufacturers, Shawbury, Shrewsbury, Shropshire, in collaboration with the Research Council of the British Whiting Federation, has made a study of whiting and other forms of calcium carbonate as fillers for natural rubber compounds. The results are recorded in two research memoranda (R 397 and R 406).

Conclusions from this work are that the behaviour of calcium carbonate fillers in rubber depends largely on their fineness, most conveniently measured by specific surface; the finest (precipitated) materials have the greatest reinforcing power judged by the tensile and tear strengths and abrasion resistance of the rubber, although on the other hand they are more difficult to mix and give rubbers with lower resilience.

Finer materials are generally more expensive to produce, and the relationships now established between particle size and rubber properties will help in choosing the appropriate balance between cost and performance.

Surface treatment with fatty acids makes the very fine precipitated materials easier to mix and increases their reinforcing power, but has little effect on the behaviour of coarser materials (with a smaller specific surface) such as ground natural whiting or limestone.

The source of the chalk used in making whiting, i.e. whether from the north or south of England deposits, and the method of grinding (wet or dry) do not appear to influence the behaviour of the resulting whiting as a filler.

Traces of manganese normally present in natural whiting show no evidence of impairing the ageing properties of the rubber, a result in accord with the tests organised by the Research Association of British Rubber Manufacturers on the proofing of mackintosh fabrics with rubber compounds containing high and low manganese whitings, the results of which are described in RABRM research memorandum R 399.

Chemical Processes of Leather Making

DR. K. G. A. PANKHURST, head of the adhesives section of the Reed paper group's packaging research and development division, on 3 January, gave a talk in the BBC's 'Science Survey' series. 'New Ways with Leather,' the talk, was broadcast in Network 3 and repeated in the Home Service the following day. Before joining the Reed Paper Group on 1 January Dr. Pankhurst was with the British Leather Manufacturers' Research Association, as head of the department of physical chemistry.

He said that chemically leather-making was a reinforcement process involving the cross-linking of the protein molecules of the skin by the tannin molecules or ions. Because of the complex fibrous structure of the skin, tanning processes were difficult to follow chemically.

'During the past ten years my colleagues and I have been studying tanning reactions by spreading very thin films, only one molecule thick (monolayers), of the skin protein on to the surface of dilute solutions of tanning agents. The properties of these films can be measured and by using these results in conjunction with other results obtained with model substances of known chemical composition we have been able to obtain a fairly clear picture of what happens chemically inside a hide when it is tanned.'

API Recognised as Degree Equivalent

Associateship of the Plastics Institute by examination has been recognised by the Burnham Committee as a degree equivalent qualification.

The institute examination is divided into four groups: (1) English and plastics technology; (2) organic chemistry and physical chemistry; (3) organic chemistry of plastics, physical chemistry of plastics and advanced plastics technology; (4) industrial administration. Physicists and engineering candidates may take alternative subjects in groups 2 and 3.

SCI Food Group Tour to Rheims Centre

Summer tour this year of the food group of the Society of Chemical Industry will be centred on Rheims, in France. As is customary, the tour will include visits to places of industrial, scientific and general interest. The intention is for the party to leave London by air on Saturday, 31 May, and to return on 7 June. Cost is expected to be about £55, and a limited number of member guests may take part in the tour. Details are available from the secretary, Dr. B. R. J. Thomas, A. Boake, Roberts Ltd., Blackhorse Lane, Walthamstow, London E17.

Chemicals are Cumberland's Second Industry

Chemical manufacture is now the second industry in the Cumberland area, employing 5,578 people, according to the annual report of the Cumberland Development Council Ltd. In 1948 chemicals were only twelfth on the list, employing 1,432 people.

CATHODE-RAY POLAROGRAPHY

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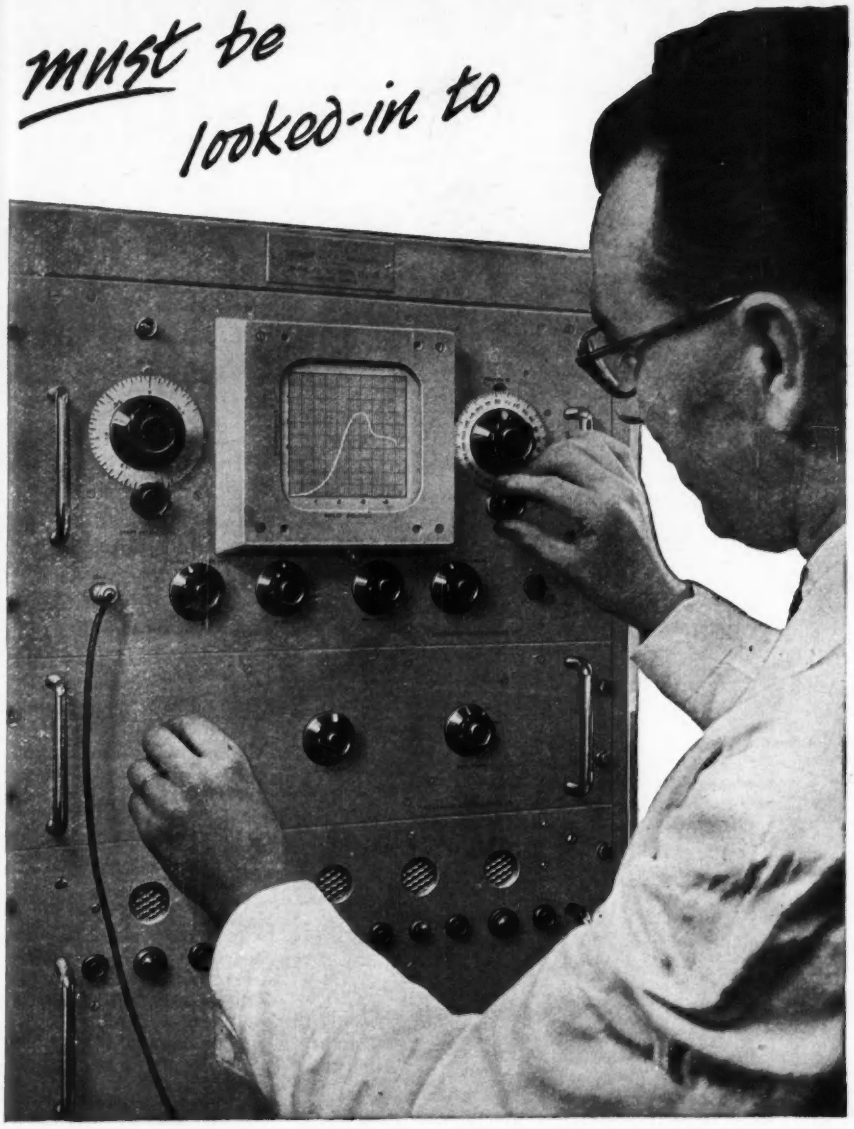

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PEOPLE in the news

● PROFESSOR E. R. H. JONES, Wayneflete Professor of Chemistry in the University of Oxford, is visiting Iran and Israel from 1 to 24 January under arrangements made by the British Council. At the invitation of the University of Teheran he will stay for 10 days lecturing on organic chemistry at the Faculty of Science in the University. He will then go to Tel-Aviv where he has been asked to lecture at the Weizmann Institute.

Professor Jones, who was born in Wrexham, Denbighshire, was a Fellow of the University of Wales from 1935–37 and became Reader in Organic Chemistry in the University of London at the end of the war. From 1947–55 he was Sir Samuel Hall Professor of Chemistry in the University of Manchester.

● DR. PETER V. CLIFTON has joined Sharples Process Engineers Ltd., 62 Brook Street, London W1, as a sales engineer. He was formerly chief chemical engineer to the APV Co., chemical engineering division.

● MR. F. M. MEDHURST, M.B.E., has retired from the board of Smith and Nephew Ltd., Welwyn Garden City. Mr. Medhurst first joined the company in 1919 as export manager. He retains his chairmanship of T. J. Smith and Nephew Ltd., Hull, and will continue as a director of the parent company, Smith and Nephew Associated Companies Ltd. Newly appointed to the board of Smith and Nephew Ltd. are MR. L. G. BELLACK and MR. P. H. RAE. Mr. Bellack joined the company as advertising manager and was promoted to the position of marketing manager for Elastoplast and Nivea products in 1955. Mr. Rae, who is a qualified pharmacist, joined the company as overseas marketing manager, having formerly been with several companies in overseas markets, including a subsidiary of Burroughs Wellcome and Co. in India, where he was sales manager.

● MR. G. W. HEMY, whose appointment as chemical sales director of Joseph Crosfield and Sons, Warrington, was announced recently (see CHEMICAL AGE, 21 December, p. 1023), was previously with the United Africa Co. Since 1950, however, he has paid regular visits to Continental countries, apart from his African travels. In 1953 he took over the UAC drugs and perfumery department. His interests range from the Latin and Greek classics to world economics, particularly those of iron curtain countries, and contemporary affairs. Mr. Hemy succeeds MR. A. C. H. CAIRNS, who becomes managing director of Unilever Export Ltd.

G. W. Hemy

● MR. COLIN CAMPBELL, managing director of Colin Campbell Pty. Ltd., Birmingham Street, Alexandria, and Campbell Tanneries Pty. Ltd., 235 Bay Street, Botany, NSW, will be visiting the UK on 24 February. He will be seeking agencies for chemicals for preshrinking materials in the cotton industry; for use in the production of nylon and other synthetic materials; for use in canning and for the washing of stone fruits before they are canned; for use in the dehydrated food industry, and wetting agents for dust control in mines and public utilities. He is also interested in agricultural and veterinary chemicals.

● MR. G. HICKSON, who has been managing director of Laporte Chemicals (Australia) Pty., is returning to the UK to be managing director of Laporte Chemicals and has been appointed a director of Laporte Industries. MR. W. WOODHALL, who has also been appointed a director of Laporte Industries, will continue as managing director of Laporte Titanium. MR. W. S. DUFFIELD is the new managing director of Laporte Chemicals (Australia).

● MR. H. C. BAIGENT has retired from the Board of the APV Co. Ltd.

● MR. HOWARD L. SANDERS, vice-president and treasurer of Commercial Solvents Corporation, New York, has been appointed president of Northwest Nitro-Chemicals Ltd., Medicine Hat, Alberta, the Canadian agricultural chemicals affiliate of Commercial Solvents. He succeeds MR. THOMAS L. BROOK, who has resigned to resume fulltime duties as chairman of the board of New British Dominion Oil Co. Ltd., Calgary.

● The resignation of MR. G. T. GAMBLE as a director of Allen and Hanburys Ltd. is announced.

● MR. ALBERT P. GAGNEBIN and MR. L. E. GRUBB have been appointed assistant vice-presidents of The International Nickel Co. Inc. Mr. Gagnebin continues as manager of the nickel sales department, which is responsible for all of the company's sales and distribution of primary nickel products in the US. Mr. Grubb, who has been general superintendent of the Huntington, West Virginia, Works of International Nickel since May 1953, will be in charge of labour relations at all US plants.

● Managing director of the Murphy Chemical Co. since its formation in 1931, MR. J. S. MITCHELL retires on 19 January. He is to continue as consultant to the board. Following Mr. Mitchell's retirement, MR. F. J. SAMWELL and MR. G. L. HEY, will be appointed joint managing directors. MR. G. PLANT has been appointed secretary.

● MR. BASIL D. THORNLEY has been appointed to the chairmanship of Bengers Ltd. and Bengers Laboratories Ltd., Holmes Chapel, Cheshire, in succession to MR. J. R. G. FISON. In addition to his duties as chairman, Mr. Thornley will continue to hold the position of managing director, the post which he has held since 1947 when Bengers became a member of the Fison's group. Joining the company in 1933 as a chemist Mr. Thornley became joint managing director in 1940. In 1950 he was instrumental in the formation of the separate concern Bengers' Laboratories Ltd., to cover the ethical pharmaceutical side of the company's business.

B. D. Thornley

● MR. A. R. MATHIAS has been appointed chairman of the Lead Development Association for the current year succeeding MR. H. L. EVANS who had held this office since January 1956. LT.-COL. W. E. GREY has been reappointed chairman of the lead sheet and pipe section of the association.

BS Tables for Aqueous Nitric Acid Solutions

THE British Standards Institute has published a new edition of BS 975: 1957, which was first issued in 1941. The 40 pages of tables based on the international critical tables give density in g. per ml. of the aqueous solution, mass in grammes of HNO_3 in 100 g. of aqueous solution, and mass in grams of HNO_3 in 1 litre of aqueous solution. The numerical data remain unchanged for the temperature range 10°C to 40°C and the density range 1,000 to 1.531. The data are set out so as to reduce to a minimum the necessity for interpolation, and to make this as simple as possible when the need arises.

Copies of this standard may be obtained from the BSI, Sales Branch, 2 Park Street, London W1, price 12s 6d.

Obituary

The death occurred on 28 December of MR. GEORGE DOUGLAS CLARKSON at the age of 83. Prior to his retirement eight years ago, Mr. Clarkson had been chief chemist with Edward Sutcliffe Ltd., maltsters, Mirfield. He was former chairman of the North of England section of the Institute of Brewing, a Fellow of the Chemical Society and a Fellow of the Royal Microscopical Society.

Commercial News

Yorkshire Copper and ICI Merger Proposals Outlined

SINCE it was announced at the end of October 1957 that the Yorkshire Copper Works Ltd. and Imperial Chemical Industries Ltd. were exploring methods of combining their activities in the copper and copper alloy tube and plate industry, negotiations have been continuing. These negotiations have now reached the stage where the merger is proposed to be effected by forming a new company, Yorkshire Imperial Metals, the share and loan capital of which will be owned 50 per cent by Yorkshire Copper and 50 per cent by ICI. The proposals are to be submitted at a meeting on 27 January.

Value of fixed assets to be transferred to the new company by ICI is indicated as £6,706,773 and net current assets of £4,019,393 will be provided. Yorkshire Copper will provide fixed assets valued at £4,406,655 and net current assets of £3,579,393.

Final issued share capital of the new company will be £1 million in £1 Ordinary, with the major part of the consideration payable by it remaining as identical loans owed to ICI and Yorkshire Copper.

Equality of interests in the new company, notwithstanding that the value of assets to be provided by ICI will exceed those to be provided by Yorkshire Copper, is stated to be compensated by the fact that ICI's profit figures in their undertaking have been less than those of Yorkshire Copper.

It is stated in the circular sent out by Yorkshire Copper that as the undertaking to be transferred by ICI forms part only of a larger undertaking no certified figure is available, but the ICI undertaking has been going through a period of reconstruction and reorganisation over the last five years. In this period the copper tube side has been moved to the new factory at Kirkby and this is reported as having had a marked effect on earnings. Earnings are now stated to be moving upwards. For the first 10 months of 1957, profits on the ICI side are estimated to be about 60 per cent of Yorkshire Copper's profit over the same period.

O. and M. Kleemann

At the recent meeting of O. and M. Kleemann a resolution for increasing the dividend on preference from 6 per cent to 6½ per cent was passed.

Dorman Long

Group profits for Dorman Long and Co. Ltd. for the year ended 30 September 1957 were £8,631,977 before taxation. After deducting profits of subsidiary companies attributable to outside shareholders (approx. £441,000), the total is £8,191,000, compared with £7,284,000 for the previous year.

Final dividend on ordinary shares of 4 per cent will be paid, making 10 per cent for the year.

Major plant developments at the Clarence works of Dorman Long (Chemicals) Ltd. were completed early in the year and throughput in all sections has increased. It is reported that with rising production at the coke ovens there will be further expansion of outputs at Clarence. Sales from Clarence have, so far, matched the volume of crude tar and benzole from the coke ovens.

The annual general meeting will be held in London on 29 January.

Gas Purification

Group profits of Gas Purification and Chemical Co. for the 15 months ended 30 June were £484,217, but after normal taxation of £126,676 and taking up subsidiaries' losses of £508,353, there was a deficit of £150,812. With additional provision of £47,895 net for income tax as a result of the change in the accounting date, and £12,743 minority interest, pre-acquisition profits, etc., parent company deficit is £211,450.

The directors are not declaring a final dividend for the 15 months; an interim of 1s was paid at 31 March 1957. For the year to 31 March 1956 an interim of 75 per cent preceded a 400 per cent scrip issue. A final of 25 per cent was paid on increased capital.

INCREASE OF CAPITAL

CHAS. LOWE AND CO. (MANCHESTER) LTD., manufacturing chemists, etc., Reddish, Stockport. Increased by £40,000 beyond the registered capital of £40,000.

Market Reports

EXPORT VOLUME SATISFACTORY

LONDON There has been no outstanding feature on the industrial chemicals market during the past week. Activity in most sections has been on a moderate scale with buyers concentrating more on forward requirements. The volume of export trade enquiry remains satisfactory under competitive conditions while home prices generally continue to display a firm undertone.

There has been little change in the demand for fertilisers while new business on the coal-tar products market has been reasonably good.

MANCHESTER Contract deliveries of the soda, potash and ammonia compounds, as well as most other descriptions of heavy chemicals, to consumers in the Lancashire and the West Riding areas, has been resumed on a reasonably good scale, with a moderate number of fresh enquiries on the Manchester market reported during the past week. Shipping business with most of the chief markets is proceeding steadily. Activity in fertilisers at the moment is confined to a relatively few sections, including the concentrated varieties and basic slag.

GLASGOW As the greater part of the week has been taken up with New Year holidays, there is nothing of importance to report from the Scottish heavy chemical market. A quick return to normal business is expected.

CONTROL APPARATUS MAKERS LOOK FOR GREATER HOME TRADE

ADEQUATE instrumentation of a plant was of growing importance throughout the whole of industry, and particularly so in the case of nuclear power plants. This was stated by Mr. S. P. Chambers, a deputy chairman of ICI Ltd., chief guest at the annual lunch of the British Industrial Measuring and Control Apparatus Manufacturers' Association, held at the Kensington Palace Hotel, London, on 7 January.

Proposing the toast of the association, Mr. Chambers said that members had probably drawn the conclusion, or inference, from the first of the Fleck Committee reports on the Windscale accident that the understanding of instrumentation of nuclear power plants was not sufficiently adequate for the running of them.

It was possible that the Windscale accident would not have taken place had the staff been given better instructions, had the instruments been better placed and had the controls been at better points.

Mr. Chambers then continued: 'Proper instrumentation—and I do not merely mean the production of first-class instruments, but also the understanding and proper use of them throughout industry—is a vital matter.' It was no good having the right instruments unless they were properly used by sufficiently trained staff. There was a crying need for people who could handle such instruments intelligently.

As plants became larger, following mergers and expansion, and as small inefficient plants become fewer, there would be an impetus towards better instrumentation and the better use of instruments.

He saw a bright future for members of the association, at a time when trade organisations were having a bad time. ICI had had to withdraw from a number of associations.

Mr. E. W. Wilson, association chairman, replying, welcomed representatives of the Rheostatic Co. which had just joined the association. He said that the attendance of just under 130 members and guests was a record for one of their lunches.

Speaking of the spirit of goodwill and co-operation among member firms, he described one of their objects as being to encourage an interchange of ideas and knowledge with the industries they served. The association asked to be taken into their confidence in their long-term planning so that its members could match the long-term requirements of those customer-industries.

Exports of member firms would have exceeded £15 million in 1957; total production being valued at about £35 million. Of the European free trade area, Mr. Wilson said: 'It appears that we shall go forward. Many of us are exporting a good deal more than we sell in the UK. That does not alter the fact that the home market is the basis on which we export. If we go forward in the FTA we should like to see the size of that foundation increased to a basis comparable to that enjoyed by our competitive territories. In this instance, we are the exception to the rule.

The Instruments, Electronics and Automation Exhibition in April would be international in scope this year and would be 50 per cent larger than in 1957.

Toast of 'The Guests' was proposed by Mr. L. S. Yoxall, president, and replied to by Mr. T. E. Goldup, president of the Institution of Electrical Engineers.

BP's Increasing Role in Petrochemicals

DIRECTORS of British Petroleum believe that net profits of the company and consolidated subsidiaries for 1957 should in spite of adverse conditions in the first half of the year not differ materially from those for 1956.

It is stated that the BP group's increasing role in the petrochemicals field is signified by the fact that with Farbenfabriken Bayer, it is shortly to go into production in Germany. In France, at the Naphthachimie plant, 18,000 tons a year of ethylene are now being produced compared with 10,000 tons until recently. At Grangemouth, where BP is in partnership with other companies in several plants, work is to start shortly on a new unit to produce synthetic phenol.

FOR YOUR DIARY

TUESDAY 14 JANUARY

Society of Chemical Industry, Chemical Engineering Group—London; 14 Belgrave Square SW1. 5.30 p.m. 'New developments in inorganic ion exchangers' by J. M. Hutcheon and C. B. Amphlett.

WEDNESDAY 15 JANUARY

Royal Institute of Chemistry—London section; College of Preceptors, 2 Bloomsbury Square WC1. 6.30 p.m. 'Recent advances in catalysis' by Prof. W. E. Garner.

Institute of Physics—London; Conference at the Institution of Civil Engineers, 'Nuclear fuel cycles', until 17 January.

Institute of Metals—London; 17 Belgrave Square SW1. 6.30 p.m. 'Mechanism of clustering and precipitation in metals' by Dr. D. Turnbull.

Society of Chemical Industry—Corrosion section, London; 14 Belgrave Square SW1. 6.30 p.m. 'Stress corrosion cracking' by T. P. Hoar and J. G. Hines.

THURSDAY 16 JANUARY

Society for Analytical Chemistry—Midland section, Birmingham; Mason Theatre, the University. 6.30 p.m. 'Analytical chemistry of nitrogen' by A. F. Williams.

Chemical Society—London; Large chemistry lecture theatre, Imperial College, South Kensington SW7. 7.30 p.m. 'Some aspects of sesquiterpenoid chemistry' by Prof. D. H. R. Barton.

FRIDAY 17 JANUARY

Chemical Society, with Birmingham University Chemical Society—Birmingham; Chemistry Department, the University. 4.30 p.m. 'Modern inorganic stereochemistry' by Prof. R. S. Nyholm.

Society of Chemical Industry—Yorkshire section, with Institute of Metal Finishing, Sheffield; Grand Hotel. 7 p.m. 'Some properties and applications of chemically reduced nickel coatings' by A. McL. Aitken.

Society of Chemical Industry—Oils and Fats Group, with OCCA, Birmingham; Regent House, Colmore Row. 6.30 p.m. 'Oxidative degradation of drying oils' by R. R. Bishop and P. Butler.

Society of Chemical Industry—Food Group, with South Wales section, Cardiff; University College, Cathays Park. 7 p.m. 'Polyphosphates in the food industry' by R. G. Scilton and J. R. Bendall.

Plastics Institute—Manchester; Engineers' Club, Albert Square. 6.45 p.m. 'Use of synthetic plastics as adhesives' by A. Baker.

Silicone Anti-dumping Duty

Further to the reference in page 117 regarding the anti-dumping duty of 4s per lb. imposed by the Board of Trade on silicones imported from France, it should be noted that this applies to polymethyl siloxane fluids (silicone fluids) only and does not affect silicone emulsions imported from the same source.

TRADE NOTES

The Cape Asbestos Co. Ltd. and their subsidiary Cape Building Products Ltd. have opened a new office at Newcastle-upon-Tyne. The address is: 19 and 20 Exchange Buildings, Quayside, Newcastle-upon-Tyne. Telephone: Newcastle 20488.

Permali Move

The London office of Permali Ltd. has moved to 39 Victoria Street SW1, which also becomes the London office for the associated companies of Hordern Richmond Ltd. and Hydulignum-Jabroc (Tools) Ltd. The telephone number, Abbey 6494, remains unchanged.

Kent's Belgium Office

Kent Continental Société Anonyme, the Belgian subsidiary of George Kent Ltd., Luton, Beds, have moved into larger premises. The new building houses the sales offices and also the service department.

New address is, 27 rue Paul-Emile Janson, Brussels, telephone Brussels 38.31.84.

Aluminium Silicate Filler

Joseph Crosfield and Son, Warrington, Lancs, announce the production of an aluminium silicate, Alusil, which, although of similar millimicron particle size and characteristics to their earlier Microcal, will, they believe, be preferred in many applications.

Alusil is stated to be the first aluminium silicate of UK manufacture to become commercially available and Crosfield offer a descriptive leaflet and technical service on request to the chemical department.

Formica Changes Announced

Formica, Thomas de la Rue and Co.'s recently formed subsidiary, have announced the following changes of name in the company's products:

Electrical and industrial laminates previously marketed as Delaron are to be known as Formica Industrial Laminates. Engraving material previously marketed as Traffolyte will be known as Formica engraving or printed material.

Extruded piping previously marketed as De La Rue polythene piping will be known as Formica polythene piping.

Change of Name

DUNHAM CHEMICAL LTD., 34 Victoria Street, London SW1. Name changed to Dunham Chemical Company (UK) Ltd.

Borax and Boric Acid Prices Increased

Prices for borax and boric acid made by Borax Consolidated Ltd., Borax House, Carlisle Place, London SW1, will be increased from 17 February. This is due, say the company, to continually increasing costs. New prices, which are net per ton carriage paid address in the UK, will be:

	Technical				British Pharmacopoeia			
	Paper bags		Hessian sacks		Paper bags		Hessian sacks	
	£	s	£	s	£	s	£	s
Borax								
Granular ...	45	10	46	10	54	10	55	10
Crystal ...	—		49	0	—		58	0
Powder ...	49	0	50	0	58	0	59	0
Powder, extra fine ...	50	0	51	0	59	0	60	0
Neobor (pentahydrate) ...	56	0	57	0	—		—	
Dehybor (anhydrous) ...	67	10	68	10	—		—	
Boric Acid								
Granular ...	76	0	77	0	89	0	90	0
Crystal ...	84	0	85	0	96	0	97	0
Powder ...	81	10	82	10	93	10	94	10
Powder, extra fine ...	83	10	84	10	95	10	96	10

Hydroquinone Prices Increased

Price increases for hydroquinone have been announced by May and Baker Ltd., Dagenham. New prices are:

25-g. bottles	3s 3d each
100-g. bottles	7s 6d ,,
500-g. bottles	26s 3d ,,
5-kg. tins	47s 3d kg.
10-kg. tins	47s 3d ,,
1-oz. bottles	3s 3d each
1-lb. bottles	24s 0d. lb.
7-lb. tins	21s 6d ,,
14-lb. tins	21s 6d ,,
28-lb. tins	21s 6d ,,

Subject to discount Containers free

Bulk	
50 kg.	25s 4d kg.
250 kg.	24s 3d ,,
500 kg.	23s 1d ,,
1,000 kg.	20s 4d ,,
1 cwt.	11s 6d lb.
5 cwt.	11s 0d ,,
10 cwt.	10s 6d ,,
1 ton	9s 3d ,,

Bulk containers free